ARITHMETIC FOR *Today* 6

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Foreword to the Teacher

Arithmetic has an essential place in child development. Children need arithmetic for practical competence and to enrich their thinking and living. An understanding of number relationships contributes to a child's emotional security.

Arithmetic in the Sixth Grade Most pupils entering the sixth grade probably know most of the number facts. They can use the facts in adding and subtracting numbers of reasonable size and in multiplying and dividing by two and three-place numbers. As they meet new experiences with numbers this year, they may have to refresh their memories of some of the facts and skills, with an advanced understanding of the number relationships involved.

Among the chief new learnings is an extension of the pupils' organized knowledge of fractions and decimals from addition and subtraction to multiplication and division. Fractional relations and fraction-decimal equivalents are emphasized as foundations for an introductory understanding of percentage.

The sequential program in measures is extended into adding, subtracting, multiplying, and dividing simple denominate numbers in functional situations. Other uses of measures this year are finding areas as well as perimeters; recording data with line, bar, and picture graphs; reading maps and scale drawings; and understanding time zones.

Arithmetic Experiences Should Be Meaningful As they recall and extend their computational skills, the pupils should continually apply them in solving problems within their experience. Problem solving of this kind makes arithmetic more meaningful to pupils and enables them to use it intelligently in their living. Problem solving continues to be a sequential learning, with major emphasis this year on problems with more than one step and the use of mental arithmetic in problem situations.

By the end of the year, pupils should have a knowledge of all the basic tools of arithmetic—the four processes as applied to whole numbers, fractions, decimals, and measures—so that they will be able to use these tools in dealing with percentage and social phases of arithmetic next year.

This Book Provides a Complete, Modern Program Pupils learn best and retain longest what they understand and use. This book provides this kind of functional, meaningful program. In it, arithmetic is taught in close connection with pupils' experiences at every step, so that pupils really understand what they are doing.

Many common experiences of pupils are built into the book, but no textbook can, of course, include all the number experiences which

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are peculiar to every locality. In the detailed Teachers' Manual which has been prepared to accompany this book, concrete suggestions are given for taking advantage of experiences in the local environment.

A New Kind of Manual The manual guides you specifically in helping every pupil make effective use of each page of this text. The Guided Learning suggestions cover Step 1: preparation for using the text ("Before Using the Book"); Step 2: the actual use of the book ("Using the Book"); and Step 3: group and individual follow-up activities ("After Using the Book").

There are social as well as learning advantages in having children attack a new topic together. The thinking of one pupil stimulates the thinking of the rest. For this reason, the first two steps should be carried out with the entire group. The pupils can later work in smaller, flexible groups for the follow-up activities.

Providing for All Levels of Ability There is ample material in this book to meet the needs of sixth-grade pupils. The book is outstanding in the way it provides for *all* levels of arithmetic ability and interest. (1) For pupils who need additional practice, the manual provides more practice in Step 3. (2) For pupils who are able to explore arithmetic ideas further, the text includes 56 pages of specially planned "enrichment material" (pages 256-311). These pages at the back of the book are keyed by footnotes to appropriate pages throughout the text.

Arithmetic Learnings Are Interdependent The scope of the learnings for the year, and the principal topics, will be found in the index on pages 313-316. For convenience of reference, the topics are listed alphabetically. Learnings in arithmetic, however, are interdependent, and require an organized program. An understanding of arithmetic is achieved by definite sequential steps. Each step leads to the next. *For this reason, it is important that you follow the order of topics as presented in the book.*

All Pupils Should Enjoy Arithmetic If pupils are successful, they will enjoy arithmetic. Each topic in this book starts with easy work so that every pupil can achieve initial success, and thus gain confidence in arithmetic.

No pupil should fail arithmetic because of reading difficulties. The reading vocabulary in this book, therefore, is very simple, and new arithmetic words are carefully introduced. Any reading difficulties that may be met should be attacked like any other reading problem. Under teacher guidance, pupils should first read silently to find out what they are to do. They should then discuss what they have read, including in the discussion any unfamiliar words or ideas they have met.

Cumulative Recall and Diagnostic Testing Cumulative reviews have been built into the text to help pupils maintain learnings. In addition, four sets of "Diagnostic Check Tests" are provided to help you and the pupils discover how much they have learned and to diagnose their needs.

OCTOBER

Arithmetic Quickies

Most of the arithmetic you use every day you do without a pencil. See whether you can do the quickies on this page without a pencil. Just tell the answers or write them on your paper.

1. Joe wants to practice on his trumpet one half hour this morning. He has practiced 25 minutes. How much longer must he practice?

2. Jill looked at the calendar. It was just 3 weeks until Halloween. How many days did Jill have to get her Halloween costume made?

3. Sue is making a dozen and a half gingerbread men to take to school. How many gingerbread men must she make?

4. Sally went to the store with $1.00 to buy some groceries for her mother. When she came home, she had 10 cents left. How much money had she spent?

5. Allen bought two rolls of film for his camera. Each roll cost 50 cents. How much did Allen spend for film?

6. Don has pulled 45 beets from his garden. He wants to tie them in bunches to sell, with 6 beets in each bunch. How many bunches will he have? How many beets will be left over?

7. Nora wants to buy a book costing $1.75. She has saved one dollar. How much more money does she still need?

8. Tom took over a newspaper route. He had 32 customers. Last week he got 9 new customers. How many customers does he have now?

9. Jean is buying some colored paper to make Christmas cards. She can get 3 sheets for 10 cents. How much will 6 sheets cost?

What Measures Do You Use?

Do you remember the different units of measure you use to measure different things? Here are some of them: inch, foot, yard, mile, second, minute, hour, day, week, month, year, ounce, pound, ton, pint, quart, gallon, bushel.

You might measure some things in more than one unit. For example, you might measure the length of your summer vacation by the *day,* or *week,* or *month;* it might be 91 days, or 13 weeks, or 3 months.

Tell what unit of measure you generally use to measure each of these things.

1. How old you are.
2. How much you weigh.
3. How tall you are.
4. The distance to a city.
5. The weight of a letter.
6. The length of a room.
7. How long it takes to run a short race.
8. The weight limit of a bridge.
9. How long you work for pay.
10. The length of a piece of cloth.
11. How long it takes you to get to school.

On your paper, write the unit of measure you use in buying each of the following things.

	a	*b*	*c*
12.	gasoline	meat	milk
13.	eggs	ribbon	strawberries
14.	paint	nails	pepper
15.	coal	garden hose	cream
16.	apples	picture molding	bananas
17.	ice cream	raspberries	sugar

Arithmetic Words and Signs

This page will show you how well you remember important words and signs you use in arithmetic.

1. What is the *product* of 8 and 5?
2. What is the *sum* of 9 and 7?
3. What is the *difference* between 14 and 6?
4. In the example $54 \div 9 = 6$, which figure is the *divisor?* What is the *quotient?*
5. In the example $15 - 8 = 7$, what is the *remainder?*
6. What is 8 *plus* 4?
7. What is 8 *times* 4?
8. What is 17 *minus* 9?
9. What is 7×6?
10. What is $48 \div 8$?
11. What is $28 + 8$?
12. What is $.50 - $.30?

Copy these examples and fill in the missing numbers.

	a	b	c
13.	$13 - 6 = ?$	$5 \times 10 = ?$	$35 \div 5 = ?$
14.	$7 \times 7 = ?$	$20 + 5 = ?$	$27 - 7 = ?$
15.	$80 \div 4 = ?$	$3 \times 20 = ?$	$30 + 40 = ?$
16.	$36 - 20 = ?$	$15 + 30 = ?$	$50 \div 10 = ?$

Copy the following examples and fill in the missing signs.

17.	$8 ? 4 = 2$	$8 ? 4 = 12$	$8 ? 4 = 4$
18.	$8 ? 4 = 32$	$15 ? 5 = 10$	$15 ? 5 = 3$
19.	$15 ? 5 = 20$	$9 ? 3 = 27$	$9 ? 3 = 12$
20.	$18 ? 6 = 24$	$18 ? 6 = 12$	$18 ? 6 = 3$
21.	$4 ? 12 = 48$	$20 ? 7 = 13$	$13 ? 7 = 20$
22.	$7 ? 14 = 21$	$24 ? 6 = 18$	$24 ? 6 = 30$

Using a Number Table

	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18

You can use this table to find any addition or subtraction fact you may have forgotten.

1. To find the sum of $6 + 8$, see where the row with the 8 at the left meets the column with the 6 at the top. What number is in that square? $6 + 8 = ?$

2. To find the difference between 13 and 5, find the 13 in the 5 row and see what number is at the top of that column. What number is it? $13 - 5 = ?$

3. The table also shows how the addition and subtraction facts are related. The colored 14 shows that $6 + 8 = 14$, $8 + 6 = 14$, $14 - 6 = 8$, and $14 - 8 = 6$. These four facts belong together. What four facts does the colored 13 show?

4. In the table, find the difference between 16 and 8. $16 - 8 = ?$ What addition fact does this show?

5. In the table, find the sum of 7 and 9. What two addition facts does this show? What two subtraction facts?

6. Can you write nine addition facts whose sums are 10? The table on page 4 will help you.

7. How many addition facts with sum 13 can you write?

Copy and finish these addition facts. Use the table to check any answers you are not sure of.

	a	*b*	*c*	*d*	e	*f*	*g*	*h*	*i*
8.	6 7	1 9	5 8	6 6	8 7	7 3	5 9	9 3	8 5
9.	3 8	7 5	9 9	8 3	4 6	7 7	9 8	6 5	3 9
10.	3 7	4 9	2 8	9 5	7 4	2 9	7 6	9 4	5 7
11.	8 9	5 5	9 6	4 8	5 6	6 4	6 9	8 4	4 7

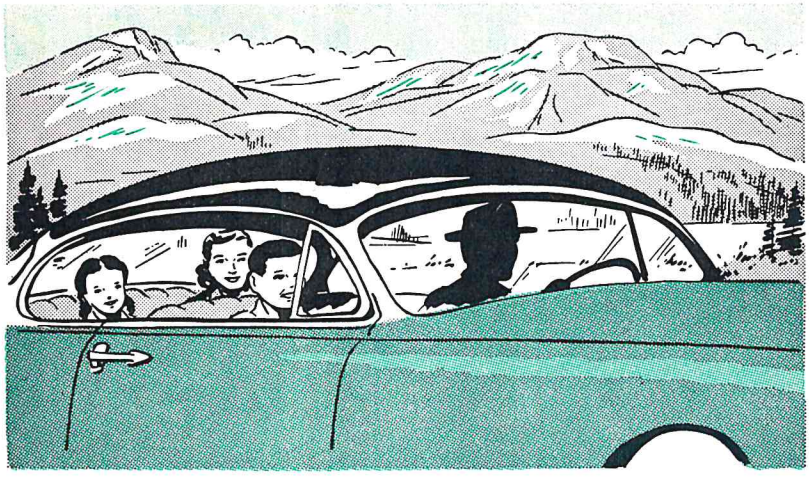
12. See if you can write nine subtraction facts whose differences are 9. The last column of the table will help you.

Copy and finish these subtraction facts.

	a	*b*	*c*	*d*	e	*f*	*g*	*h*
13.	13 9	17 8	14 5	10 7	18 9	11 5	13 7	12 3
14.	12 8	11 3	15 7	10 6	13 4	12 6	11 8	10 4
15.	14 7	11 6	11 7	12 4	17 9	10 2	10 9	15 8
16.	11 2	9 5	12 9	15 6	10 8	13 6	10 1	14 9
17.	15 9	12 5	11 4	13 8	10 3	12 7	11 9	10 5

If you had trouble with any of these facts, be sure to learn them.

Can You Carry in Addition?



	thousands	hundreds	tens	ones
	0	0	7	2	9
			4	7	5
	0	1	2	0	4

1. The Lanes are starting on a week-end trip in their new car. When they started, Tony saw that the speedometer read 729 miles. Their road map showed that they would drive 475 miles. To find what the speedometer would read at the end of the trip, add 729 and 475.

First, add the ones: $9 + 5 = 14$. Write the 4 ones and carry the 1 ten to the tens. Tell how to finish the addition. The answer has ? thousand, ? hundreds, ? tens, ? ones.

$$\begin{array}{r} 89 \\ 128 \\ 136 \\ \hline 353 \end{array}$$

2. The pupils in Ann's school gave their play three times. The first time, 89 people saw the play. The second time, 128 people came. The third time, 136 people were there. To find how many people saw the play, add the three numbers.

How many tens do you carry to the tens column? How many hundreds do you carry?

3. Copy 1678 + 796 + 1367 + 89 in columns. Keep your columns straight. Add down. How many tens do you carry? How many hundreds? How many thousands are there in your answer? Check your answer by adding up.

Copy, add, and check.

	a	*b*	*c*	*d*	e
4.	27 36	35 59	118 25	293 456	79 336
5.	36 28 14 86 69	47 59 64 75 57	46 92 89 88 53	97 84 58 67 21	63 59 97 50 84
6.	275 868 745	468 794 758	154 578 899	959 987 849	508 362 750
7.	3876 135 2534 3265	655 3638 1248 207	2049 1769 667 6150	779 598 2502 3281	4050 4980 3976 6819

Copy in columns, add, and check.

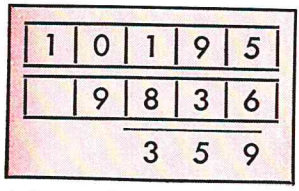
8. 88 + 312 + 552 + 8 + 73

9. 68 + 3501 + 533 + 4334 + 40

Can you add the following numbers without copying them? Just write the answers.

	a	*b*	*c*	*d*
10.	17 + 4	29 + 2	26 + 6	14 + 9
11.	37 + 20	60 + 36	90 + 27	65 + 14
12.	52 + 64	250 + 30	147 + 22	70 + 314

Can You Borrow in Subtraction?



1. When the Lanes started on a trip in their car, the speedometer read 9,836 miles. At the end of the trip, it read 10,195. To find how many miles they had driven on the trip, subtract 9,836 from 10,195.

Start with the ones place. You cannot take 6 from 5, so you think of one of the 9 tens as 10 ones and subtract 6 from 15. When you subtract the hundreds, you must borrow one of the 10 thousands, and subtract 8 from 11. How many miles had the Lanes driven?

To check the answer, add 359 and 9,836. Is the sum 10,195?

Copy, subtract, and check.

	a	b	c	d	e
2.	43 18	34 27	126 69	112 75	136 97
3.	271 127	690 424	988 959	681 305	485 429
4.	908 833	876 484	518 321	677 296	819 342
5.	605 367	861 183	960 762	1357 698	1440 575
6.	600 408	5050 2869	2042 747	5040 1465	6000 5133

	a	b	c	d
7.	64—29	126—88	112—57	136—79
8.	390—268	409—315	1714—668	1353—859
9.	1315—708	1531—949	8922—7583	5000—909

Do You Add or Subtract?

Number your paper 1 to 7. Read each problem carefully and decide whether you add or subtract to find the answer. After each number on your paper, write A if you add in that problem or S if you subtract. Then solve the problem and write the answer after the letter. *Is your answer reasonable?*

1. Nora is reading a library book which has 216 pages. She has read 150 pages. How many pages has she still to read?

2. Jerry collects stamps. He has 195 United States stamps in his big album and 89 duplicate United States stamps which he uses for trading. How many United States stamps does Jerry own?

3. There are 369 pupils in Joan's school. There are 524 pupils in Larry's school. How many pupils are there in both schools?

4. When school opened this fall, there were 93 sixth graders in Jim's school. Now there are 102. How many sixth graders have entered the school since it opened?

5. The Lanes are taking a trip in their car. At the end of the first day, they had gone 278 miles. At the end of the second day they had gone 731 miles in all. How many miles did they drive the second day?

6. Don's father is a farmer. He has two apple orchards. This year he got 907 bushels of apples from his larger orchard and 396 bushels from his smaller orchard. How many bushels of apples did he get this year?

7. By air line it is 1856 miles from Chicago to San Francisco. The distance by road for an automobile is 2235 miles. How much shorter is the air line distance?

Can You Build Roman Numbers?

Ann saw the letters MCMXLIX carved in the cornerstone of her school. This Roman number tells the year the school was built. Knowing how the ancient Romans made numbers like this will help you read them.

The Romans used seven capital letters for numbers.
I = 1 V = 5 X = 10 L = 50 C = 100 D = 500 M = 1000

They made their numbers by adding and subtracting these letters.

1. A smaller number written *after* a larger number is *added* to the larger number. So LX = 60, and LII = 52. What does LXX mean? CX? CXIII? MD? LXVI?

2. A smaller Roman number written *before* a larger number is *subtracted* from the larger number. So XL = 40, and MCM = 1900. What does IX mean? XC? LIX? XCIX? XLIV? MCMIV?

3. See if you can write a table of the Roman numbers by tens to one hundred. Start: X, XX, XXX, XL.

4. Now write a table of Roman numbers by hundreds to two thousand. Start: C, CC, CCC, CD.

5. Roman numbers are used on some clock faces. Write these twelve Roman numbers.

Copy these Roman numbers. After each one, write the correct number picked from the list that follows.

6. XLVIII, XLIX, LXVII, LXXXIV (49, 67, 84, 48)

7. XCIX, CXI, XCVIII, CLX (111, 99, 160, 98)

8. MCMLIX, MCMXLIV, MLXVI, MDCCLXXVI (1066, 1776, 1959, 1944)

9. Now see if you can read the date Ann saw on her school. In what year was the school built?

10. Write the Roman number that comes just after XXXIV. Just after XLIX. After LXXVIII. After MCML.

11. Write the Roman number that comes just before L. Just before LXV. Before XCIV. Before MCMLIX.

12. Write the Roman number that comes between XIII and XV. Between XIX and XXI. Between XXXVIII and XL.

13. Which number is smallest, LXI, LIX, or XLI?

14. Which number is largest, MDCC, MDCLX, or MCM?

15. See if you can add XXIX and XLV.

16. Subtract XVIII from XXVI.

17. What famous event happened in the year MCDXCII?

18. One of Nora's books was printed in MCMXXXIX. What year was that? The last chapter in this book is Chapter XXIV. How many chapters are there in the book?

19. The date on a church in our town is MDCCLXVII. In what year was the church built?

20. Can you write the following numbers as Roman numbers? 62 130 147 250 1015 1956

21. In what places do you find Roman numbers used today?

Pages 256 and 257 provide enrichment material which can be used after this page.

Making Change

1. Don often helps his father sell fruit and vegetables at their road stand during the summer. When Don gives a customer change for a purchase, he uses as few pieces of money as possible. If a customer hands him a dollar to pay for a 32¢ purchase, Don counts out 3 pennies, 1 nickel, 1 dime, and 1 half dollar, saying, "32¢, 35¢, 40¢, 50¢, $1.00." How much change did Don give the customer? $1.00 − 32¢ = ?

2. Count out the change Don would give for a 13-cent purchase from a half dollar. What is the smallest number of coins Don could give? How much change should he give?

3. Count out the change for a $1.35 purchase from 5 dollars. How much change did the customer receive?

4. One customer made a purchase of 27 cents. She handed Don a dollar and 2 pennies. How much change should Don have given her?

5. Another customer gave Don 3 dimes for a 23-cent purchase. How much change should Don have given her?

6. How much money are two dimes and a quarter worth?

7. How much change should Don have given to a customer who handed him a quarter and a half dollar for a purchase of 55 cents?

8. A man bought a basket of peaches for 60 cents and some tomatoes for 28 cents. He handed Don a dollar bill. How much change should Don have given him?

9. A woman made purchases of 15 cents and 20 cents. She gave Don two quarters. How much change should she get?

10. What two coins could Don use to make 35 cents worth of change?

11. What three coins make 40 cents?

12. What three coins make 45 cents?

13. What four coins make 22 cents?

14. Once Don ran out of dimes and half dollars. A customer handed him a dollar for a 28-cent purchase. How many coins did Don have to use to make change?

Tell what pieces of money Don would use in making change for each of the following purchases. On your paper, write the total amount of change he would give for each purchase.

	Purchase	*Payment*
15.	7 cents	a quarter
16.	10 cents and 26 cents	a half dollar
17.	63 cents	a quarter and a half dollar
18.	79 cents	a dollar
19.	31 cents	a dollar and a penny
20.	45 cents and 40 cents	two half dollars
21.	$1.12	two dollars
22.	$2.40	five dollars
23.	$4.82	five dollars

Can You Add Money Numbers?

When you add money numbers, remember to put in the *dollar sign* and the *decimal point.* Where does the decimal point always go? How many figures come after the decimal point?

Copy, add, and check.

1.	$ .56	$ .79	$ 7.05	$ 5.69	$24.88
	.24	.92	2.87	28.91	7.91
	.70	.69	8.99	5.07	79.50
2.	$ .29	$ .75	$ 6.74	$ 9.48	$ 7.95
	.63	3.56	4.42	8.67	6.89
	.34	3.00	6.59	7.79	7.00
	.69	1.89	5.59	8.87	8.37
3.	$ 6.54	$ 5.48	$15.35	$27.50	$26.38
	7.49	.69	8.60	8.39	6.50
	8.55	.69	4.88	27.78	16.48
	8.79	3.48	13.28	9.49	39.85
4.	$54.59	$17.57	$42.57	$ 55.09	$167.46
	13.79	28.68	39.69	112.36	63.47
	7.50	5.58	43.68	9.64	246.00
	46.58	17.60	4.53	72.76	8.27
5.	$10.55	$64.88	$13.56	$93.49	$ 46.66
	3.09	6.55	8.56	17.09	52.87
	45.54	8.09	36.50	4.22	9.00
	7.43	3.30	4.48	88.17	174.97
	5.00	19.25	97.25	19.13	34.56

6. $3.28 + $8 + $12.80 + 97¢ + 69¢

7. $10 + $17.36 + $3.66 + $5 + $5.88

8. $7.55 + $129.72 + $6.98 + $56.07 + $45.77

9. $9.43 + $14.66 + $242.37 + $4.32 + $67.28

Can You Subtract Money Numbers?

When you subtract money numbers, be sure you write dollars under dollars and cents under cents. Remember to write the dollar sign and decimal point in every answer.

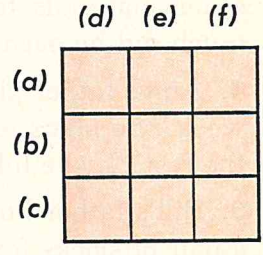
Copy, subtract, and check.

	a	b	c	d	e
1.	\$1.75 .87	\$2.00 .63	\$1.00 .92	\$3.50 .79	\$7.08 3.45
2.	\$8.05 5.08	\$5.00 1.77	\$8.73 2.64	\$6.92 4.87	\$8.28 7.49
3.	\$7.13 2.37	\$12.41 7.59	\$13.45 9.36	\$12.50 8.24	\$18.61 6.26
4.	\$15.03 9.88	\$32.17 16.09	\$25.00 8.25	\$40.00 35.01	\$108.73 64.80
5.	\$290.60 18.90	\$200.00 143.15	\$823.85 326.29	\$650.00 355.78	\$925.72 436.75

	a	b	c
6.	\$1.21 − \$.39	\$5 − \$4.24	\$1.61 − 58¢
7.	\$8.92 − \$6.74	\$13.13 − \$6.79	\$14 − \$7.69
8.	\$42 − \$13.12	\$125.75 − \$59.56	\$150 − \$83.98

A Cross-Number Puzzle

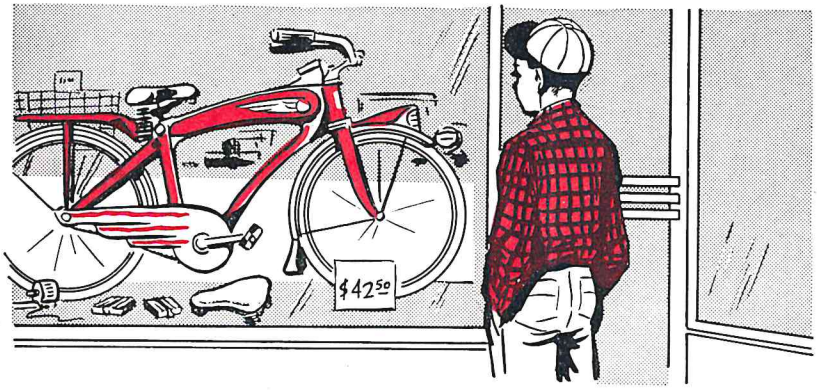
Copy the square at the right. Find the answers to the examples below and write them in your square. If your work is correct, the answers *down* will check the answers *across*.



Across: (a) 647 + 98 (b) 308 + 517 (c) 68 + 492

Down: (d) 1000 − 215 (e) 1205 − 779 (f) 1112 − 562

Using Money



1. Bill is saving money for a bicycle costing $42.50. He has saved $37.90. How much money does Bill still need for his bicycle?

Ask yourself whether you should add or subtract in this problem. You subtract because you are to find how much is still needed.

Can you solve the following addition and subtraction problems about earning, spending, and saving money?

2. Last week, Sue earned 75 cents for baby sitting with her aunt's baby and $1.75 for helping her mother clean the house. How much did she earn doing both things?

3. Dick spent $8.67 for an old table and for paint and other materials to refinish it. He sold it for $15. How much did he earn by his work?

4. Ann's father gives her an allowance of $2 a week. This week, she plans to spend $1.35 of her allowance and save the rest. If she follows her plan, how much will she save?

5. Bill's father bought him a sports jacket for $13.89 and a pair of slacks for $6.45. How much did he pay for Bill's clothes?

6. Jean is saving for Christmas. Last week she had $9.38 saved. This week she has saved $1.75 more. How much money does she have for Christmas now?

7. Allen had saved $25. Then he bought a new camera for $18.69. How much money did he have left?

8. Allen bought a roll of color film for $3.50. He handed the clerk a five-dollar bill. How much change did he get?

9. Sam wants to buy a pair of ice skates costing $7.98 and a hockey stick costing $1.75. How much money will he need in all?

10. Peggy is saving for a pair of roller skates. She can get a pair for $2.45. A better pair costs $3.20. How much more must she pay for the better pair?

11. Ann has saved $15.90. How much does she still need to buy a United States Savings Bond for $18.75?

12. The pupils in Dick's school have a school bank. Dick had $4.68 in his school bank account. Then he deposited 55 cents more. How much did he have in the bank then?

13. Bob earned $1.40 one week. He deposited 65 cents in the school bank. How much did he keep out to spend?

14. Jill has $3.80 in her dime bank at home. She has $4.36 in the school bank. How much has she saved in all?

15. Jim has a weekly allowance of $1.50. Last week he earned $1.85. How much money did he get last week?

16. A television set which Mr. Gray wants to buy has been reduced from $225 to $198.95. How much has the price been cut?

17. Bill's father bought a second-hand boat for $75 and a sail for $38.50. How much did he pay for both?

Pages 258 and 259 provide enrichment material which can be used after this page.

Do You Remember Measures?

Do you remember abbreviations of measure words? Here is a list of some common abbreviations.

bu.	da.	doz.	ft.	gal.	hr.	in.	lb.	mi.
min.	mo.	oz.	pt.	qt.	sec.	wk.	yd.	yr.

For each of the following pairs of measure words, write the correct abbreviation.

	a	*b*	*c*
1.	ounce, ounces	mile, miles	quart, quarts
2.	pound, pounds	week, weeks	yard, yards
3.	minute, minutes	day, days	foot, feet
4.	second, seconds	inch, inches	gallon, gallons
5.	bushel, bushels	year, years	month, months

Do you remember measure facts? The tables on page 312 will help you. On your paper, write the *larger* of each of the following pairs of measures.

6.	1 lb. or 13 oz.	1 ft. or 13 in.	1 yr. or 10 mo.
7.	1 min. or 75 sec.	1 gal. or 5 qt.	1 yd. or 33 in.
8.	1 bu. or 30 qt.	1 da. or 30 hr.	1 mi. or 1500 yd.

Can you change measures? Copy and complete:

	a	*b*
9.	24 oz. = 1 lb. ? oz.	85 sec. = 1 min. ? sec.
10.	22 in. = 1 ft. ? in.	15 mo. = 1 yr. ? mo.
11.	7 gal. 7 qt. = 8 gal. ? qt.	7 lb. 20 oz. = 8 lb. ? oz.
12.	9 ft. 18 in. = 10 ft. ? in.	3 hr. 105 min. = 4 hr. ? min.
13.	1 lb. 8 oz. = ? oz.	1 ft. 9 in. = ? in.
14.	6 hr. 20 min. = 5 hr. ? min.	7 lb. 5 oz. = 6 lb. ? oz.

Can You Add Measures?

1. Bob painted his new hen house with two coats of white paint. He used 2 gallons and 3 quarts for the first coat and 1 gallon and 2 quarts for the second coat. To find how much paint he used in all, you add 2 gal. 3 qt. and 1 gal. 2 qt. The sum is 3 gal. 5 qt. But 5 qt. is more than another gallon. It is 1 gal. 1 qt.

2 gal. 3 qt.
1 gal. 2 qt.
3 gal. 5 qt. =
4 gal. 1 qt.

How much paint did Bob use?

2. Bob sold two chickens. One chicken weighed 3 lb. 11 oz. The other weighed 4 lb. 9 oz. To find the total weight of the chickens, add.

3 lb. 11 oz.
4 lb. 9 oz.
7 lb. 20 oz. =
8 lb. 4 oz.

Explain the work shown at the right. How much did the two chickens weigh?

3. Dick is building a stand for a television set. Last Saturday he worked 3 hr. 45 min. in the morning and 2 hr. 35 min. in the afternoon. How long did he work altogether that day?

4. Jean is 10 yr. 9 mo. old. Her brother Tony is 2 yr. 5 mo. older than Jean. How old is Tony?

Can You Subtract Measures?

11 hr. 5 min.	= 10 hr. 65 min.
9 hr. 25 min.	= 9 hr. 25 min.
	1 hr. 40 min.

1. Joe plays the trumpet in a band he has organized. One Saturday morning, Joe's band practiced from 9:25 to 11:05. To find how long the band practiced, subtract 9 hr. 25 min. from 11 hr. 5 min.

Since you cannot subtract 25 min. from 5 min., you must change 11 hr. 5 min. to 10 hr. 65 min. You do this by taking 1 hr. (60 min.) from 11 hr. Now subtract.

How long did Joe's band practice? Check by adding 1 hr. 40 min. to 9 hr. 25 min. Does the sum equal 11 hr. 5 min.?

2. The turkey the Lanes bought for Thanksgiving dinner weighed 13 lb. 6 oz. Their Christmas turkey weighed 10 lb. 14 oz. Find how much heavier their Thanksgiving turkey was by subtracting 10 lb. 14 oz. from 13 lb. 6 oz.

3. From a board 9 ft. 7 in. long, Dick sawed off a piece 1 ft. 10 in. long. How long was the piece that was left?

4. Ann's summer vacation was 10 weeks and 3 days long. Three weeks and 5 days had already passed. How many weeks and days of her vacation were left?

Adding Measures

Copy and add.

	a	*b*	*c*
1.	2 hr. 30 min. 1 hr. 50 min.	2 lb. 10 oz. 3 lb. 8 oz.	9 yr. 11 mo. 3 yr. 6 mo.
2.	5 ft. 9 in. 4 ft. 6 in.	5 gal. 1 qt. 2 gal. 2 qt.	7 yd. 2 ft. 8 yd. 1 ft.
3.	6 qt. 1 pt. 4 qt. 1 pt.	7 wk. 5 da. 2 wk. 3 da.	1 min. 9 sec. 58 sec.
4.	3 lb. 12 oz. 14 oz. 1 lb. 4 oz.	3 min. 34 sec. 2 min. 52 sec. 3 min. 19 sec.	5 ft. 8 in. 5 ft. 3 in. 4 ft. 11 in.

See if you can make up addition problems using the numbers in some of these examples. For example 1*a*, you might start, "I worked 2 hours and 30 minutes helping polish our car and 1 hour and 50 minutes raking up leaves."

Subtracting Measures

Copy, subtract, and check by adding.

	a	*b*	*c*
1.	5 ft. 3 in. 4 ft. 10 in.	4 lb. 4 oz. 3 lb. 10 oz.	6 ft. 4 ft. 9 in.
2.	5 gal. 3 gal. 3 qt.	7 qt. 1 qt. 1 pt.	11 wk. 4 da. 4 wk. 6 da.
3.	9 hr. 36 min. 6 hr. 18 min.	12 hr. 8 hr. 28 min.	14 yr. 4 mo. 9 yr. 8 mo.
4.	1 min. 5 sec. 56 sec.	13 yd. 1 ft. 9 yd. 2 ft.	10 yd. 6 yd. 20 in.

Make up subtraction problems about some of these examples.

Do You Add or Subtract?

Read each of these problems carefully and decide whether you should add or subtract. Then find the answer and see if it is sensible. You may be able to do some problems as quickies.

1. Mary Lou is 11 years and 4 months old. Her sister Sylvia is 9 years and 6 months old. How much younger is Sylvia?

2. Mr. Lane says it will take 3 hours and 45 minutes to drive to the seashore. If the Lanes start at 7:15 a.m., when will they get to the seashore?

3. Tony Lane went deep-sea fishing with his father. Tony caught a fish weighing 5 lb. 4 oz. The largest fish his father caught weighed 4 lb. 10 oz. How much heavier was Tony's fish than his father's?

4. Mr. Lane bought a 5-gallon can of oil for his car. He has used 2 gal. 2 qt. of this oil. How much oil is left in the can?

5. Dick needs three pieces of board: one 2 ft. 8 in. long, one 4 ft. 6 in. long, and one 5 ft. long. Can he get all three pieces from a board 12 ft. long?

6. Frances is just 10 years old. Her brother Norman is 2 years and 6 months older. How old is Norman?

7. One Saturday, Don worked for his father from 1:15 p.m. to 4 p.m. How long did he work?

8. Nora ordered 3 books to be sent by parcel post. They weighed 1 lb. 2 oz., 1 lb. 8 oz., and 1 lb. 12 oz. Find their total weight.

9. Peggy is 4 ft. 6 in. tall. Her mother is 5 ft. 5 in. tall. How much taller than Peggy is her mother?

10. Last year Bill's best time in running around the school track was 2 min. 17 sec. This year he can run around the track in 1 min. 58 sec. His time this year is how much faster than last year?

11. Sally bought 6 yards of goods to make some aprons for Christmas presents. After she had made the aprons, she had 23 inches of the material left. How much had she used?

12. Ann's class is giving a 25-minute assembly program. The program started at 10:45 a.m. When will it be over?

13. One day last summer, Sue picked 8 qt. 1 pt. of raspberries in the morning and 5 qt. 1 pt. in the afternoon. How many quarts did she pick that day?

14. This year, Don's garden was 14 yd. 1 ft. long and 10 yd. 2 ft. wide. The length was how much more than the width?

15. Don weighed two watermelons which he grew in his garden. One weighed 21 lb. 8 oz. The other weighed 18 lb. 12 oz.

a. How much did both melons weigh?

b. How much more did the first melon weigh than the second?

16. Mrs. Gray took 8 quarts of ice cream to a picnic. After the picnic was over, there was 1 qt. 1 pt. of ice cream left. How much ice cream had been eaten?

17. When Bill's school opened, it was 8 wk. 3 da. until Halloween. From Halloween until Thanksgiving Day was 3 wk. 6 da. How long was it from the day school opened until Thanksgiving Day?

Pages 260 and 261 provide enrichment material which can be used after this page.

Round Numbers

You often use round numbers when you measure, estimate, and solve problems without a pencil. Here are some problems in which you use round numbers. Can you do them without using a pencil except to write the answers?

1. Jim wanted a sport shirt costing $2.95 and a sweater costing $4.89. *To the nearest dollar,* how much did each cost? *In round numbers,* how much did they both cost?

2. At a special sale, a vacuum cleaner was reduced from $106.00 to $99.98. Find the amount of the reduction to the nearest dollar.

3. Ann's father is 38 years and 10 months old. Ann is 11 years and 2 months old. *To the nearest year,* how old is each? In round numbers, how many years older than Ann is her father?

4. Last year, Dick weighed 77 lb. 4 oz. This year, he weighs 81 lb. 14 oz. *About* how many pounds has he gained?

5. By air, the distance from New York to San Francisco is 2580 miles. By automobile, the distance is 3147 miles. Express both these distances *to the nearest hundred* miles. Then find in round numbers how many miles farther it is by automobile than by air.

6. Mount Rainier in Washington is 14,408 ft. high. *To the nearest thousand* feet, it is 14,000 ft. high. Mount Washington in New Hampshire is 6,288 ft. high. How many feet high is it to the nearest thousand feet? To the nearest thousand, how many feet higher than Mt. Washington is Mt. Rainier?

7. Mt. Everest in Asia is 29,002 ft. high. *In round numbers (to the nearest thousand),* how many feet higher than Mt. Washington is Mt. Everest?

Rounding Off Numbers

1. There are 537 pupils in the school to which Joyce goes. Any number from 450 to 549, rounded off to the nearest hundred, is 500. To the nearest hundred, there are 500 pupils in Joyce's school.

Round off each of these numbers to the *nearest hundred.*

268 743 889 998 1331 4760

2. There are 19,650 pupils in all the schools of Joyce's city. Any number from 19,500 to 20,499 rounded off to the nearest thousand is 20,000. To the nearest thousand, there are 20,000 pupils in Joyce's city.

Round off each of these numbers to the *nearest thousand.*

2,452 4,958 8,389 29,709 73,067

3. Joyce read in the paper that the latest census showed that there were 4,746,921 people living in her state. To the nearest million, this is 5,000,000 people.

Round off each of these numbers to the *nearest million.*

1,803,970 6,644,325 87,349,000 159,507,000

4. Round off 9,615,839 to the nearest hundred. Now round it off to the nearest thousand. Round it to the nearest million.

It is easier to understand and compare numbers when they have been rounded.

5. The new high school building in Joyce's city cost $1,937,248. Round this number to the nearest million.

6. The distance around the earth at the equator is 24,902 miles. How many miles is this to the nearest thousand?

7. In a recent year, the farmers in the United States sold 133,181,000 bushels of apples and 74,780,000 bushels of peaches. Find to the nearest million how many more bushels of apples than peaches were sold that year.

Can You Use Our Number System?

1. Our way of writing numbers is called the Arabic system. Our number system is easier to use than the Roman system because with us each figure or digit has a *place value.* In the number 5,624,387, the digit 5 has a value of 5 million, the 6 has a value of 6 hundred thousand (600,000), the 2 has a value of 20,000. What value has the 4? The 3? The 8? The 7?

3,000,000
900,000

2. Write the value of the 3 in the number 3,915,624. Under it, write the value of the 9, then the value of the 1 and each of the other digits. Start as shown at the left. Now add all these numbers. Is the sum 3,915,624?

3. Write the number that means 6 thousands, 4 hundreds, 0 tens, 9 ones or units. This number is a four-place number.

4. Write the largest four-place number you can, using the digits 3, 8, 6, 5 each once.

5. Write the smallest five-place number you can, using all these digits: 9, 1, 7, 0, 2.

6. Write the smallest four-place number you can, using four different digits.

7. Write the largest five-place number you can, using five different figures.

8. In a recent year, the population of the whole world was given as 2,264,563,771. The diagram below pictures this number.

Billions		Millions		Thousands		Hundreds	Tens	Ones
2	,	264	,	563	,	7	7	1

Round off this number to the nearest million.

9. How many thousands are 80,000? 120,000? 1,000,000? A million is how many thousands?

10. How many millions are 300,000,000? 1,000,000,000? A billion is how many millions?

11. At one time, the public debt of the United States was $232 billion (232 billion dollars). Write this number. How many zeros did you use? How many commas?

12. The population of the United States is now more than 160000000. How many millions is this? (Commas will help.)

13. One year, 1,850,140,000 pounds of peanuts were raised in the United States. Round this to the nearest billion.

Using Zeros

1. In the number 3,190, how many ones are there?

2. In 706, what does the zero show?

3. If $30.25 were written without the zero, how much money would it mean?

Write each of the following numbers in figures.

4. Three hundred four

5. Nine thousand six

6. Ten thousand twenty

7. One thousand two hundred

8. Write the following numbers in figures and add them.
Two dollars and ten cents
Nine dollars and four cents
Thirty dollars and seventy-five cents
One hundred dollars and fifty cents

9. Write these numbers in figures and add them.
3 million, 90 thousand, 75
10 million, 403 thousand, 640
7 million, 8 thousand, 9

Pages 262 and 263 provide enrichment material which can be used after this page.

Multiplication and Division Facts

	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

This table will help you find any multiplication or division fact you may have forgotten.

1. To find the product of 7×8, see where the row with 7 at the left meets the column with 8 at the top. What number is in that square? $7 \times 8 = ?$

2. To find the quotient of $54 \div 9$, look up 54 in the 9 row. What number is at the top of the 54 column? $54 \div 9 = ?$

3. The table also shows how the multiplication and division facts are related. Either 56 shows that $7 \times 8 = 56$, $8 \times 7 = 56$, $56 \div 7 = 8$, $56 \div 8 = 7$. What four facts does the 54 show?

4. In the table, find the product of 7×7. $7 \times 7 = ?$ What division fact does this show?

5. Find the quotient of $42 \div 6$. $42 \div 6 = ?$ What other division fact does this show? What two multiplication facts?

6. There are two multiplication facts whose product is 35. What are they?

7. Give two multiplication facts whose product is 63.

8. There are nine division facts whose quotient is 9. Give them. The last column of the table will help you.

9. Give nine division facts whose quotient is 7.

Copy and finish these multiplication facts. Use the table to check any answers you are not sure of.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
10.	6	5	9	5	7	3	7	9	8
	9	5	8	6	7	5	4	7	2
11.	5	4	8	9	9	5	8	6	7
	8	9	3	5	9	7	4	8	3
12.	4	7	8	9	7	9	6	3	5
	8	5	9	2	8	6	4	9	4
13.	5	9	6	2	4	8	6	8	3
	9	3	7	9	6	8	5	7	8
14.	4	7	8	8	9	7	4	6	3
	7	6	5	6	4	9	5	6	7

Copy and finish these division facts.

	a	*b*	*c*	*d*	*e*	*f*
15.	$8\overline{)56}$	$6\overline{)54}$	$7\overline{)49}$	$9\overline{)72}$	$4\overline{)32}$	$5\overline{)45}$
16.	$9\overline{)54}$	$4\overline{)24}$	$9\overline{)36}$	$3\overline{)24}$	$2\overline{)18}$	$9\overline{)27}$
17.	$8\overline{)32}$	$9\overline{)81}$	$2\overline{)14}$	$8\overline{)64}$	$6\overline{)42}$	$6\overline{)48}$
18.	$7\overline{)35}$	$8\overline{)24}$	$5\overline{)40}$	$7\overline{)56}$	$6\overline{)24}$	$8\overline{)40}$
19.	$4\overline{)36}$	$8\overline{)48}$	$6\overline{)30}$	$9\overline{)63}$	$5\overline{)30}$	$2\overline{)16}$
20.	$8\overline{)72}$	$3\overline{)27}$	$7\overline{)28}$	$5\overline{)25}$	$9\overline{)18}$	$9\overline{)45}$
21.	$5\overline{)35}$	$7\overline{)63}$	$3\overline{)18}$	$6\overline{)36}$	$7\overline{)42}$	$4\overline{)28}$

If you had trouble with any of these facts, learn them.

Multiplying by One-Figure Numbers

This page will show you how much you know about multiplying by a one-figure number. Copy the examples and write the products. Check each answer by going over your work.

84 2 168

Can you multiply a two-figure number?

	a	*b*	*c*	*d*
1.	52 4	81 6	93 3	73 2

79 6 474

Can you carry in multiplication?

2.	19 7	36 4	69 5	96 8

327 9 2943

Can you multiply a three-figure number?

3.	846 3	582 7	715 5	356 6

406 7 2842

Can you multiply with zeros?

4.	80 5	709 4	600 9	170 8

Can you multiply a four-figure number?

2507 3 7521

5.	1569 2	3047 7	5438 8	1895 9
6.	4180 4	2004 6	4923 5	6894 7

Can you multiply money numbers?

7.	$.84 9	$.27 3	$.09 6	$.62 8

$7.50 8 $60.00

8.	$1.29 2	$2.70 9	$3.06 7	$8.50 5
9.	$3.18 6	$8.29 8	$1.75 4	$7.68 6

Dividing by One-Figure Numbers

This page will help you remember what you have learned about division by a one-figure divisor. Copy the examples and find the quotients. Check each example by multiplying the quotient by the divisor.

Can you divide with a remainder?

	a	b	c
1.	$3\overline{)23}$	$7\overline{)45}$	$4\overline{)19}$
2.	$9\overline{)60}$	$8\overline{)70}$	$5\overline{)34}$

Can you divide with zeros?

3.	$2\overline{)616}$	$3\overline{)627}$	$6\overline{)420}$
4.	$8\overline{)2440}$	$5\overline{)2000}$	$9\overline{)6381}$

Can you bring down in division?

5.	$6\overline{)276}$	$2\overline{)158}$	$4\overline{)300}$
6.	$3\overline{)174}$	$5\overline{)190}$	$8\overline{)232}$
7.	$7\overline{)507}$	$9\overline{)488}$	$6\overline{)575}$

Can you bring down twice?

8.	$2\overline{)1290}$	$5\overline{)3640}$	$7\overline{)6538}$
9.	$4\overline{)1272}$	$8\overline{)3808}$	$6\overline{)1974}$
10.	$9\overline{)6552}$	$3\overline{)1038}$	$8\overline{)4952}$
11.	$7\overline{)3637}$	$6\overline{)5231}$	$9\overline{)5845}$
12.	$8\overline{)3901}$	$5\overline{)3955}$	$7\overline{)6025}$

Can you divide money numbers?

13.	$4\overline{)\$3.68}$	$6\overline{)\$2.76}$	$7\overline{)\$5.18}$
14.	$3\overline{)\$5.25}$	$8\overline{)\$42.40}$	$5\overline{)\$25.30}$
15.	$9\overline{)\$28.40}$	$4\overline{)\$34.83}$	$6\overline{)\$21.05}$

$$\begin{array}{r} 8\frac{5}{6} \\ 6\overline{)53} \\ 48 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 906 \\ 4\overline{)3624} \end{array}$$

$$\begin{array}{r} 58 \\ 7\overline{)406} \\ 35 \\ \hline 56 \\ 56 \\ \hline \end{array}$$

$$\begin{array}{r} 318 \\ 9\overline{)2862} \\ 27 \\ \hline 16 \\ 9 \\ \hline 72 \\ 72 \\ \hline \end{array}$$

$$\begin{array}{r} \$.95 \\ 5\overline{)\$4.95} \\ 45 \\ \hline 45 \\ 45 \\ \hline \end{array}$$

Multiplying by Two-Figure Numbers

$7.89	Multiplicand
25	Multiplier
3945	Partial Product
1578	Partial Product
$197.25	Product

1. Twenty-five cots were bought for the kindergarten room in Jill's school. Each cot cost $7.89. To find the total cost of the cots, multiply $7.89 by 25.

In 25, there are 5 ones and 2 tens. So multiply first by 5. The first partial product is 3945. Now multiply by the 2 tens. The final zero in this partial product is not written. Instead, start writing the partial product in the tens place.

Add the two partial products. Write the dollar sign and the decimal point. What was the total cost of the cots?

Copy and multiply. Be sure to point off two places in each product and to write the dollar sign. Check by going over your work.

	a	*b*	*c*	*d*	*e*
2.	$.56	$.75	$.84	$1.98	$3.50
	45	68	39	25	17

Practice in Multiplying

These examples will help you make sure you can multiply by two-figure numbers. Check by going over your work or by multiplying again on another paper.

	a	b	c	d	e
1.	86 60	47 40	96 37	93 49	68 81
2.	$.65 20	$.76 19	$.70 35	$.95 69	$.90 80
3.	134 68	307 27	275 38	820 49	198 70
4.	$2.94 15	$2.07 60	$4.20 70	$6.38 35	$4.29 62

Another Way to Check Multiplication

Mr. Lane's car averages 18 miles on a gallon of gasoline. He told Tony that he bought 76 gallons of gasoline last month. To find about how many miles Mr. Lane had driven, multiply 18 by 76.

Multiply	Check
18 76	76 18
108 126	608 76
1368	1368

You can check by exchanging the multiplicand and multiplier and multiplying again.

Copy and multiply. Check by multiplying again with a different multiplier.

	a	b	c	d	e
1.	71 49	85 74	86 68	64 79	39 80
2.	$.75 25	$.19 30	$.71 17	$.50 39	$.94 48

Multiplication Quickies

These problems show some short ways of multiplying that will help you multiply without using a pencil. Just tell the answers or write them on your paper.

1. In the Central School, there are 328 children. Each child gets 10 pencils a year. To find how many pencils are needed for the school, you can multiply 10 by 328, or 328 by 10. It is easier to multiply 328 by 10. Just write 0 after 328. How many pencils are needed?

2. Don's father pays him 10 cents a quart for picking raspberries. One week, Don picked 28 quarts. To find how much Don earned that week, multiply 28 by 10. Remember, your answer is a money number.

3. Jerry has 240 stamps he wants to sell for 1 cent each. To find how much he would get for all of them, multiply 1 cent ($.01) by 240. How many cents would he get? How many dollars and cents are there in 240 cents?

Give the missing products:

	a	*b*	*c*
4.	$10 \times 25 = ?$	$10 \times 98 = ?$	$10 \times 60 = ?$
5.	$10 \times 365 = ?$	$10 \times 500 = ?$	$10 \times 407 = ?$
6.	$28 \times \$.01 = ?$	$145 \times \$.01 = ?$	$400 \times \$.01 = ?$
7.	$325 \times \$.01 = ?$	$150 \times \$.01 = ?$	$300 \times \$.01 = ?$

8. Jill wants to buy 100 fancy tulip bulbs costing 10 cents each. How much must she pay for all of them?

9. Find the cost of 125 penny pencils.

10. Ten boys in Bill's club are going to see a baseball game. The trip will cost each boy $1.50. Find the total cost of the trip.

Thinking About Numbers

See how many of these questions you can answer without using a pencil. Think what you have to do to answer each question, then tell or write the answer.

1. What number is 8 more than 13?
2. What number is 7 less than 30?
3. What number is 4 times as large as 12?
4. What number is one third of 45?
5. What number must be added to 15 to make 24?
6. What number must be subtracted from 32 to give 25?
7. How many 8's are there in 72?
8. How much larger is 45 than 39?
9. Eighteen is how much smaller than 30?
10. Thirty is how many times as large as 6?
11. Forty divided by what number equals 8?
12. Nine times what number equals 54?
13. Eight is what fractional part of 24?
14. In the number 476, what is the value of the 7?
15. What is the number that means 6 tens and 9 ones?
16. If 32 is multiplied by 10, what will be the value of the figure 3 in the product?
17. In the number 505, the 5 at the left is worth how many times as much as the 5 at the right?
18. How many zeros do you use in writing "six thousand four" in figures?
19. How many thousands are there in one million?
20. What is the largest four-figure number you can make using the figures 3, 8, 7, 5?

Three-Figure Multipliers

Multiply	*Check*
\$196	435
435	196
980	2610
588	3915
784	435
\$85260	85260

1. It costs about \$196 a year to educate each pupil in Bill's school. There are 435 pupils in the school. To find the total cost of running the school for a year, multiply \$196 by 435.

Before multiplying a long example like this, it is a good idea to estimate the answer. Round \$196 and 435 each to the nearest hundred and multiply the round numbers. What is your estimated product?

Now multiply 196 by 435. The number 435 means 400 + 30 + 5, so you are really multiplying first by 5, then by 30, and then by 400, and adding the three partial products. The shorter way of doing this is shown in the box above.

You multiply first by 5 ones, writing the first figure of the partial product (0) in ones place. Then you multiply by 3 tens, writing the first figure of the partial product (8) in tens place. Then you multiply by 4 hundreds, writing the first figure of the partial product (4) in hundreds place. Add the three partial products.

You do not have to write a point in the product. Why? How much does it cost to run Bill's school for a year? Was your estimate within a few thousand dollars of this answer?

Copy, multiply, and check.

	a	*b*	*c*	*d*	e
2.	287 146	479 736	597 584	486 219	351 167
3.	\$4.35 1 45	\$6.84 2 78	\$8.32 2 89	\$5.75 3 29	\$4.99 4 95

Multiplying With Zeros

Multiply	*Check*
\$6.75	107
1 07	675
47 25	535
675 0	749
\$722.25	642
	72225

1. Don's father has a field of strawberries on his farm. Last year, he sold 107 crates of strawberries at an average price of \$6.75 a crate. To find how much he received for his strawberries, multiply \$6.75 by 107. How do you know your answer should be more than \$675?

When you multiply, look out for the zero. You don't multiply by any tens because there are no tens in 107. Put a zero in the tens place in your second partial product to show there are no tens. When you multiply by the 1 hundred, you must start writing the partial product in the hundreds place.

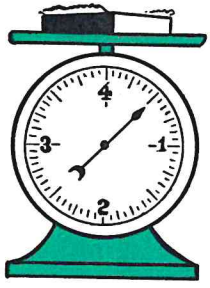
It is very important to check a long example like this.

Copy, multiply, and check.

	a	*b*	*c*	*d*	*e*
2.	695	746	589	804	507
	309	807	270	609	500
3.	\$7.83	\$2.58	\$6.09	\$8.17	\$9.50
	4 90	1 08	5 06	3 00	4 00

Pages 264 and 265 provide enrichment material which can be used after this page.

Fractions of Measures

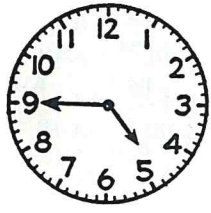


1. Sue knows that her friends like homemade candy, so this year she is going to make candy for Christmas presents. She will put it in half-pound boxes. How many ounces of candy should she put in each box?

$\frac{1}{2}$ of 16 oz. = ? oz.

Copy these examples and fill in the missing numbers.

	a	*b*	*c*
2.	$\frac{1}{2}$ doz. = ?	$\frac{1}{3}$ doz. = ?	$\frac{1}{4}$ doz. = ?
3.	$\frac{1}{2}$ qt. = ? pt.	$\frac{1}{2}$ gal. = ? qt.	$\frac{1}{4}$ gal. = ? qt.
4.	$\frac{1}{4}$ yd. = ? in.	$\frac{1}{2}$ yd. = ? in.	$\frac{1}{3}$ yd. = ? in.
5.	$\frac{1}{2}$ hr. = ? min.	$\frac{1}{4}$ hr. = ? min.	$\frac{1}{3}$ hr. = ? min.
6.	$\frac{1}{2}$ bu. = ? qt.	$\frac{1}{4}$ bu. = ? qt.	$\frac{1}{8}$ bu. = ? qt.



7. Joe is taking trumpet lessons so he can play in the school band. He told his music teacher he would practice on his trumpet for three quarters of an hour every day. How many minutes is this? One quarter hour is 15 minutes, so $\frac{3}{4}$ = 3 × 15 min. = ? min.

Copy and finish the following examples.

8.	$\frac{3}{4}$ doz. = ?	$\frac{3}{4}$ ft. = ? in.	$\frac{3}{4}$ yr. = ? mo.
9.	$\frac{3}{4}$ lb. = ? oz.	$\frac{3}{4}$ gal. = ? qt.	$\frac{3}{4}$ hr. = ? min.
10.	$\frac{3}{4}$ yd. = ? in.	$\frac{3}{4}$ bu. = ? qt.	$\frac{3}{4}$ da. = ? hr.
11.	$\frac{2}{3}$ doz. = ?	$\frac{2}{3}$ yd. = ? ft.	$\frac{2}{3}$ min. = ? sec.
12.	$\frac{3}{8}$ lb. = ? oz.	$\frac{5}{8}$ lb. = ? oz.	$\frac{3}{8}$ bu. = ? qt.
13.	$\frac{5}{6}$ ft. = ? in.	$\frac{5}{6}$ yd. = ? in.	$\frac{5}{6}$ hr. = ? min.

Which Is Larger?

See if you can work these examples without using your pencil except to write the answers.

1. Which is heavier, $\frac{3}{4}$ lb. or 10 oz.?
2. Which is longer, $\frac{2}{3}$ ft. or 10 in.?
3. Which is longer, $\frac{1}{6}$ hr. or 12 min.?
4. Which is more, $\frac{1}{4}$ bu. or 6 qt.?
5. Which is longer, $\frac{3}{4}$ yd. or 25 in.?
6. Which is longer, $\frac{3}{4}$ min. or 40 sec.?
7. Which is more, $\frac{1}{4}$ doz. or $\frac{1}{3}$ doz.?
8. Which is longer, $\frac{3}{4}$ ft. or $\frac{2}{3}$ ft.?
9. Which is heavier, $\frac{3}{8}$ lb. or $\frac{1}{2}$ lb.?
10. Which is longer, $\frac{3}{4}$ yd. or $\frac{1}{2}$ yd.?
11. Which is more, $\frac{1}{2}$ bu. or $\frac{5}{8}$ bu.?
12. Which is longer, $\frac{5}{8}$ in. or $\frac{1}{2}$ in.?
13. Which is farther, $\frac{3}{4}$ mi. or $\frac{1}{2}$ mi.?
14. Which is heavier, $\frac{1}{2}$ ton or $\frac{3}{4}$ ton?
15. Which is longer, $\frac{2}{3}$ hr. or $\frac{1}{2}$ hr.?
16. Is $18 + 7$ larger, or smaller, than 2×15?
17. Is $40 - 6$ larger, or smaller, than 3×10?
18. Is $120 \div 3$ larger, or smaller, than 36?
19. Is 245 larger, or smaller, than 10×25?
20. Which is larger, 178, or 10×16?
21. Which is larger, \$4.75, or $10 \times$ \$.49?
22. Is 100×43 larger, or smaller, than 4280?
23. Can 8×70 be subtracted from 557?
24. Can $10 \times$ \$.57 be subtracted from \$6.00?

Measure Quickies

These quickies will show you how well you can use measure facts in solving problems. Use your pencil only to write the answers.

1. Jean's mother pays her 10 cents a day for helping with the dishes. How much does Jean earn in a week?

2. Jill was to take a bus leaving at 3: 05. The bus was a quarter of an hour late. When did the bus leave?

3. Sue puts $2 a month into a Christmas Savings Club. How much does she save a year this way?

4. Bill ran a race in 56 seconds. Tom's time for the race was 1 minute 2 seconds. How many seconds longer did Tom take?

5. The largest fish Sam caught last week weighed 1 lb. The smallest fish he caught weighed 10 oz. How many ounces heavier was Sam's largest fish?

6. Sally has gone to visit her grandmother for two weeks. She has been there 4 days. How many more days has she to stay?

7. Dick is making a birdhouse. If he cuts a piece 5 inches long from a board 1 foot long, how many inches will be left?

8. Ann measured a piece of ribbon with a yardstick. It was 1 yard 5 inches long. How many inches long was it?

9. Tom read that "a pint's a pound, the world around." If this is true, about how many pounds does a quart of milk weigh?

10. Bill wants to order a new string for the bow in his bow and arrow set. The old string is 5 feet and 5 inches long. How many inches long is it?

11. Ellen can buy a half gallon of ice cream for $1.00. How much a quart does that ice cream cost?

12. Ellen found that a quart pitcher holds about 4 glasses of lemonade. She made a gallon of lemonade for her party. How many glasses of lemonade did she make?

13. Don picked a bushel of apples and sold 3 pecks. How many pecks of apples were left?

14. Mr. Gray bought a gallon of oil for his truck for $1.20. How much a quart did he pay for this oil?

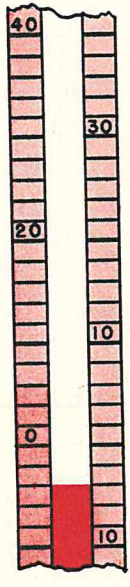
15. Larry has been ill, but for 2 days his temperature has been normal. How many hours has his temperature been normal?

16. At the circus, Jim saw an elephant that weighed 3800 pounds. How many pounds more than 1 ton does it weigh?

17. Bill's father is planning to take Bill with him to climb Mt. Washington next summer. Mt. Washington is 6,288 feet high. How many feet more than a mile high is Mt. Washington?

18. Bob has a colt. If the colt eats 4 quarts of corn a day, how many days will a bushel of corn last?

19. The part of a thermometer at the right shows $-4°$ (4 degrees below zero). The freezing point of water is $32°$. How many degrees below freezing does the thermometer show?



You have needed a measure fact to solve each of these problems except the last one.

For Problem 1, you had to know the fact that 1 week = 7 days. Tell what fact you needed for each problem.

Preparing for Two-Figure Division

These examples will help you estimate quotients, multiply numbers mentally, and subtract larger numbers in division examples. You will use these skills in the work with two-figure divisors starting on page 44.

1. In 201, there are six 30's. Here you are dividing 201 by 30, and there are six 3's in 20; $201 \div 30 = 6$, with a remainder. How many 30's are there in 147?

Give the following quotients, without the remainders.

	a	*b*
2.	How many 30's in 97?	How many 20's in 48?
3.	How many 20's in 109?	How many 30's in 169?
4.	How many 40's in 126?	How many 40's in 290?
5.	How many 10's in 47?	How many 50's in 314?
6.	How many 80's in 580?	How many 60's in 505?
7.	How many 70's in 245?	How many 90's in 603?

8. In 236, there are five 42's, because there are almost as many 42's in 236 as there are 4's in 23. How many 53's are there in 229?

9.	How many 32's in 70?	How many 41's in 374?
10.	How many 91's in 406?	How many 53's in 295?
11.	How many 73's in 539?	How many 82's in 521?
12.	How many 62's in 400?	How many 71's in 685?
13.	How many 22's in 179?	How many 83's in 460?

Estimate each quotient without writing the remainder.

	a	*b*	*c*	*d*	*e*
14.	$50\overline{)435}$	$90\overline{)680}$	$60\overline{)97}$	$20\overline{)132}$	$80\overline{)700}$
15.	$42\overline{)264}$	$63\overline{)475}$	$31\overline{)299}$	$73\overline{)460}$	$92\overline{)509}$

Can you multiply numbers without writing the multiplier under the multiplicand? Copy each of the following examples in a line as it is written, and write the missing products. Or, if you prefer, just write the answers on your paper without copying the examples.

	a	b	c
16.	$3 \times 30 = ?$	$4 \times 21 = ?$	$2 \times 32 = ?$
17.	$2 \times 54 = ?$	$5 \times 91 = ?$	$6 \times 72 = ?$
18.	$5 \times 34 = ?$	$6 \times 83 = ?$	$5 \times 52 = ?$
19.	$6 \times 45 = ?$	$5 \times 86 = ?$	$7 \times 65 = ?$
20.	$4 \times 84 = ?$	$8 \times 73 = ?$	$2 \times 57 = ?$
21.	$9 \times 93 = ?$	$7 \times 12 = ?$	$4 \times 36 = ?$
22.	$3 \times 49 = ?$	$8 \times 24 = ?$	$7 \times 63 = ?$
23.	$9 \times 64 = ?$	$4 \times 75 = ?$	$9 \times 72 = ?$
24.	$8 \times 58 = ?$	$6 \times 96 = ?$	$9 \times 85 = ?$
25.	$3 \times 25 = ?$	$7 \times 84 = ?$	$8 \times 96 = ?$
26.	$5 \times 70 = ?$	$3 \times 78 = ?$	$9 \times 63 = ?$

In some of the following subtraction examples, you cannot subtract. Why? Copy all the examples. Cross out on your paper the examples in which you cannot subtract. Work the rest of the examples.

	a	b	c	d	e
27.	78 80	93 80	50 44	101 99	127 128
28.	567 572	896 892	612 612	438 473	520 480
29.	780 792	510 460	650 657	588 588	800 765
30.	367 360	600 624	509 511	748 738	700 680

Division With One-Figure Quotients

$$\begin{array}{r} 6 \\ 32\overline{)200} \\ 192 \\ \hline 8 \end{array}$$

1. Don has 200 strawberry plants to set out in his garden. He can put 32 plants in a row. To find how many rows he will have, divide 200 by 32. There are three steps in this division.

(1) Divide. There are about as many 32's in 200 as there are 3's in 20. $20 \div 3 = 6$, with a remainder. Write 6 over the ones figure in 200.

(2) Multiply. $6 \times 32 = 192$. 192 is smaller than 200.

(3) Subtract. $200 - 192 = 8$.

How many rows will Don have? How many plants left over?

Copy and divide. Some of the examples have remainders.

	a	*b*	*c*	*d*	*e*
2.	$32\overline{)96}$	$21\overline{)84}$	$44\overline{)88}$	$11\overline{)66}$	$12\overline{)48}$
3.	$21\overline{)105}$	$31\overline{)217}$	$41\overline{)164}$	$52\overline{)208}$	$61\overline{)488}$
4.	$23\overline{)92}$	$29\overline{)58}$	$34\overline{)102}$	$22\overline{)132}$	$37\overline{)74}$
5.	$52\overline{)312}$	$43\overline{)258}$	$64\overline{)448}$	$58\overline{)290}$	$86\overline{)602}$
6.	$42\overline{)310}$	$63\overline{)336}$	$52\overline{)228}$	$73\overline{)445}$	$34\overline{)239}$
7.	$82\overline{)590}$	$43\overline{)351}$	$94\overline{)600}$	$62\overline{)358}$	$74\overline{)675}$

Page 266 provides enrichment material which can be used after this page.

Division With Two-Figure Quotients

```
    $.75
42)$31.50
   29 4
   ----
    2 10
    2 10
    ----
```

1. Forty-two pupils, teachers, and parents want to take a trip from Bob's school to the city. The bus will cost $31.50. To find how much each person will have to pay, divide $31.50 by 42.

There are four steps in finding the first figure in the quotient.

(1) Divide 315 by 42: $31 \div 4 = 7$, so 7 is the trial quotient figure. Where do you write the 7?

(2) Multiply 42 by 7. Is 294 smaller than 315?

(3) Subtract 294 from 315. Is the remainder (21) larger than 42 (the divisor)?

(4) Bring down the 0 after the 21.

There are only three steps in finding the second figure in the quotient. What are they?

How much must each person pay?

Check this example in the same way you check other division examples. Multiply $.75 (the amount each person will have to pay) by 42 (the number of persons paying). The product should be the cost of the bus. Is it?

Copy, divide, and check.

	a	*b*	*c*	*d*
2.	$21\overline{)273}$	$31\overline{)744}$	$42\overline{)882}$	$23\overline{)966}$
3.	$42\overline{)1806}$	$32\overline{)2016}$	$51\overline{)2703}$	$43\overline{)2580}$
4.	$64\overline{)2688}$	$53\overline{)3922}$	$90\overline{)4410}$	$83\overline{)5810}$
5.	$72\overline{)6048}$	$85\overline{)5440}$	$54\overline{)3348}$	$73\overline{)5475}$
6.	$21\overline{)\$15.75}$	$63\overline{)\$22.68}$	$75\overline{)\$69.00}$	$53\overline{)\$42.93}$
7.	$92\overline{)\$80.04}$	$67\overline{)\$39.53}$	$80\overline{)\$76.00}$	$74\overline{)\$44.40}$

Do You Multiply or Divide?

1. Last summer, Larry went to England on an ocean liner. It is about 3900 miles between New York and London. A sailor told Larry he had made this trip 58 times. How many miles had he gone?

What two number facts does this problem tell you? What does the problem ask you to find? Do you multiply or divide with these two numbers to find the answer?

Number your paper 1 to 13. After each number, write M or D, to show whether you multiply or divide in that problem. Write the answer after the letter.

Remember, you **multiply** to find how many in all when you know how many groups there are and how many are in a group. You **divide** to find the number of groups or how many in each group.

2. One day last summer, Don helped his father pack strawberries in crates. There were 18 crates with 24 quarts of strawberries in each crate. How many quarts of strawberries did they pack?

3. Don pulled 75 radishes in his garden. He tied them in bunches, with 12 radishes in each bunch. How many bunches did he have? How many radishes were left over?

4. One month, Bob sold 21 young chickens. He received $19.74 in all for them. How much was this for each chicken, on the average?

5. A gross is 12 dozen. Jean counted 20 gross of pencils in the school supply room. How many pencils were there?

6. One hundred eight new dictionaries have been ordered for Jean's school. Each dictionary costs $2.75. What was the total cost of the dictionaries?

7. There are 32 pupils in Jean's room. Miss Clayton handed Jean 100 sheets of drawing paper to give the pupils for art work. How many sheets should each child get? Would there be any paper left over? How much?

8. The 15 girls in Peggy's Girl Scout troop gave an entertainment to raise spending money for a trip. They made $21, which they shared equally. How much did each girl get?

9. In July, Mr. Lane drove his car 2325 miles. How many miles a day did he drive, on the average?

10. Mr. Lane estimates that he drives 2,000 miles a month on the average. About how many miles a year does he drive? About how many miles has he driven in 10 years?

11. Tony's committee has 180 chairs to place in the school gymnasium. If they can put 15 chairs in each row, how many rows will there be?

12. A peach orchard on Don's farm has 18 rows of trees with 16 trees in each row. How many peach trees are there in the orchard?

13. Bob has 32 hens. One month they laid 608 eggs. Find the average number of eggs laid by each hen.

Page 267 provides enrichment material which can be used after this page.

Division With a Remainder

$$\begin{array}{r} 48 \text{ r } 3 \\ 12\overline{)579} \\ 48 \\ \hline 99 \\ 96 \\ \hline 3 \end{array}$$

1. Last month, Bob's chickens laid 579 eggs. To find how many dozen eggs Bob got that month, divide 579 by 12.

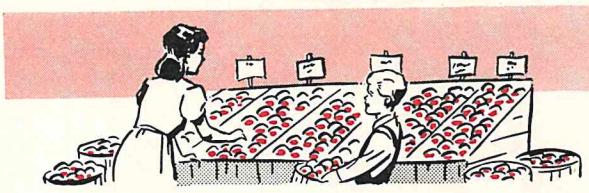
Tell the four steps you use to find the first figure in the quotient. When you divide 57 by 12 ($5 \div 1$), is the trial quotient figure the real quotient figure? How can you tell?

How many dozen eggs did Bob get? How many eggs over? Notice how the remainder, 3, is written in the quotient. To check, multiply 48 by 12 and add the remainder to the product. Do you get 579 as your answer?

Copy, divide, and check. Most of the examples have remainders.

	a	*b*	*c*	*d*
2.	$32\overline{)998}$	$21\overline{)1774}$	$73\overline{)4692}$	$80\overline{)6656}$
3.	$34\overline{)2049}$	$46\overline{)4462}$	$54\overline{)3430}$	$68\overline{)4783}$
4.	$83\overline{)6100}$	$95\overline{)5890}$	$56\overline{)5060}$	$92\overline{)7636}$
5.	$64\overline{)\$33.50}$	$53\overline{)\$42.50}$	$90\overline{)\$68.00}$	$56\overline{)\$39.91}$
6.	$79\overline{)\$25.28}$	$38\overline{)\$20.00}$	$63\overline{)\$51.25}$	$84\overline{)\$79.80}$

Three-Figure Quotients



1. One Saturday, Don and his mother sold 35 bushels of apples at their roadstand. They took in $80.50 for all of the apples. Find the average price they received per bushel by dividing $80.50 by 35.

Check by multiplying $2.30 by 35. Is the product $80.50?

```
      $2.30
35)$80.50
   70
   ---
   10 5
   10 5
   ----
      0
```

2. The Lanes are planning their vacation trip for next summer. They will drive about 4,000 miles. Mr. Lane thinks they can average about 38 miles per hour. To find about how many hours they will drive, divide 4000 by 38.

```
     105
38)4000
   38
   --
    200
    190
    ---
     10
```

Do you see why the second figure of the quotient is 0? You bring down twice. Check the answer.

Copy, divide, and check.

	a	*b*	*c*	*d*
3.	$13\overline{)1586}$	$23\overline{)7322}$	$42\overline{)25914}$	$34\overline{)23902}$
4.	$53\overline{)49502}$	$72\overline{)60192}$	$67\overline{)13668}$	$43\overline{)39990}$
5.	$21\overline{)\$133.35}$	$89\overline{)\$272.34}$	$93\overline{)\$682.62}$	$54\overline{)\$334.80}$
6.	$63\overline{)\$598.50}$	$94\overline{)\$771.74}$	$76\overline{)\$689.32}$	$83\overline{)\$707.16}$

Pages 268 and 269 provide enrichment material which can be used after this page.

Trying Several Quotient Figures

(a)
$$\begin{array}{r} 5 \\ 16\overline{)576} \\ 80 \end{array}$$

(b)
$$\begin{array}{r} 4 \\ 16\overline{)576} \\ 64 \end{array}$$

(c)
$$\begin{array}{r} 39 \\ 16\overline{)576} \\ 48 \\ \hline 96 \\ 144 \end{array}$$

(d)
$$\begin{array}{r} 36 \\ 16\overline{)576} \\ 48 \\ \hline 96 \\ 96 \end{array}$$

1. The P.T.A. of Jill's school is making sandwiches for a school picnic. The sandwiches will take 576 slices of bread in all. There are 16 slices of bread in one loaf. To find how many loaves of bread will be needed, divide 576 by 16.

(a) To find the first quotient figure, divide 57 by 16. Think $5 \div 1 = 5$. But $5 \times 16 = 80$. 80 is larger than 57, so 5 is too large.

(b) Try 4. $4 \times 16 = 64$, so 4 is too large, too.

(c) Try 3. $3 \times 16 = 48$, and 9 is less than 16, so 3 is right. Now find the second quotient figure. Divide 96 by 16. Think $9 \div 1 = 9$. But 9 is much too large.

(d) The second quotient figure must be much smaller than 9, but larger than 5, because you have found that $5 \times 16 = 80$. Try 6. 6 is right.

Check this answer.

(a) Too Large	(b) Too Small	(c) Right
$39\overline{)200}$ 6 234	$39\overline{)200}$ 4 156 44	$39\overline{)200}$ 5 195 5

2. If a car averages 39 miles an hour, about how many hours would it take it to go 200 miles?

Divide 200 by 39. *(a)* You may think $20 \div 3 = 6$. But when you multiply, you find the product is too large.

(b) You may try a smaller number, 4. But the remainder (44) is larger than the divisor (39), so 4 is too small.

(c) Then 5 must be the right quotient. It will take a little more than 5 hours to drive 200 miles.

Since this divisor, 39, is almost 40, you may save time by dividing 20 by 4 instead of by 3.

In dividing, you may have to try several quotient figures. Try a figure that seems right. If it is too large, try a smaller figure. If it is too small, try a larger figure.

Rounding the divisor to the nearest ten sometimes helps in estimating the quotient figure.

Copy, divide, and check.

	a	b	c	d
3.	$12\overline{)552}$	$14\overline{)406}$	$18\overline{)684}$	$15\overline{)1110}$
4.	$13\overline{)1118}$	$37\overline{)2331}$	$58\overline{)2842}$	$79\overline{)6873}$
5.	$24\overline{)672}$	$69\overline{)3933}$	$49\overline{)4675}$	$97\overline{)3800}$
6.	$67\overline{)\$54.27}$	$43\overline{)\$32.68}$	$21\overline{)\$20.26}$	$34\overline{)\$33.00}$
7.	$16\overline{)3120}$	$34\overline{)8650}$	$45\overline{)12625}$	$86\overline{)60050}$
8.	$59\overline{)\$109.15}$	$17\overline{)\$54.00}$	$98\overline{)\$245.50}$	$77\overline{)\$739.49}$

Estimating Answers

1. Jim's father bought Jim three neckties. One tie cost 97¢, one cost $1.15, and one cost $1.89. Before his father paid for them, Jim estimated how much all the ties would cost by rounding each number to the nearest dollar. What is your estimate of the total cost? Find the exact total. How close did you come?

Estimating answers by using round numbers will often keep you from making silly mistakes in arithmetic. In each of the problems below, estimate the answer and write your estimate. Then solve the problem and write the exact answer. See how close your estimate was.

2. Jim's father also bought him four shirts. They cost $2.95 each. How much did all four shirts cost?

3. At a sale, a table radio that had been $23.19 was reduced to $19.98. Find the amount of the reduction.

4. Ann's new dress cost $12.89. Her new hat cost $5.95. How much did they cost together?

5. One Saturday morning, Don worked from 8:06 to 10:55. How long did he work that morning?

6. If an automobile goes 39 miles an hour and an airplane goes 195 miles an hour, how much faster than the automobile does the airplane go? How many times as fast?

7. Nora wants to buy a set of books costing $12.10. She has saved $9.85. How much money does she still need?

8. In 3 months, Jean saved $11.85 for Christmas. How much did she save per month, on the average?

9. Mrs. Lane bought groceries costing $6.87. She gave the clerk $10. How much change should she get?

10. Jean's committee is making 336 tickets for the school play. How many sheets of paper will they need for the tickets if each sheet makes 28 tickets?

11. From a ham weighing 12 lb. 3 oz., the butcher cut off a piece weighing 1 lb. 13 oz. How much did the ham weigh then?

12. On a trip, we drove 1576 miles in 4 days. How many miles a day did we drive on an average?

13. The tank in our car holds 18 gallons of gasoline. If we can get 21 miles on each gallon of gasoline, how many miles will a tankful of gasoline take us?

14. Sylvia's big brother is 6 ft. 1 in. tall. Sylvia is 4 ft. 10 in. tall. How much taller is Sylvia's brother?

15. One year, there were 45,476,891 automobiles in the entire world. Of these, there were 32,557,954 in the United States. How many automobiles outside the United States were there? (Estimate to the nearest million.)

16. In 1940, there were 6,907,387 people in California. In 1950, the population of California had grown to 10,586,223. How much did the population of California grow in those 10 years?

Pages 270 and 271 provide enrichment material which can be used after this page.

Dividing by Three-Figure Numbers

$$\begin{array}{r} 35 \\ 144\overline{)5040} \\ 432 \\ \hline 720 \\ 720 \\ \hline \end{array}$$

1. Ellen's committee is finding out how much it cost to buy supplies for their school last year. The principal of the school told Ellen they used 5040 pencils last year. The pencils were bought by the gross (144). To find how many gross were used last year, divide 5040 by 144.

Use the same steps that you would with a two-figure divisor.

(1) Divide 504 by 144. $5 \div 1 = 5$, but 5 is quite a bit too large. Try 3 for the first quotient figure.

(2) Multiply: $3 \times 144 = 432$.

(3) Subtract 432 from 504.

(4) Bring down 0.

Explain how to finish the division. Check the answer.

Copy, divide, and check.

	a	*b*	*c*	*d*
2.	$215\overline{)9080}$	$308\overline{)11088}$	$824\overline{)13184}$	$450\overline{)31450}$
3.	$600\overline{)21000}$	$946\overline{)57109}$	$890\overline{)85000}$	$500\overline{)65000}$
4.	$365\overline{)75920}$	$418\overline{)98230}$	$726\overline{)77600}$	$232\overline{)69675}$

A Short Way of Dividing

1. Nora is reading one of the books she received for her birthday. She wonders how many words a minute she is reading on the average. In 5 minutes she read 1190 words.

There is a shorter way of dividing by a one-figure number than the way you have learned. You *write* only the quotient. You *think* the rest of the steps as you divide.

At the right, is shown this short way of dividing 1190 by 5. How many words per minute was Nora reading? Check the answer by multiplying 238 by 5. Is the quotient right?

$$5\overline{)1190}\quad 238$$

Copy, divide in the short way, and check.

	a	*b*	*c*	*d*
2.	$2\overline{)76}$	$3\overline{)54}$	$6\overline{)210}$	$3\overline{)222}$
3.	$5\overline{)475}$	$8\overline{)376}$	$9\overline{)333}$	$4\overline{)720}$
4.	$4\overline{)836}$	$2\overline{)1054}$	$7\overline{)4263}$	$6\overline{)1068}$
5.	$3\overline{)\$2.85}$	$5\overline{)\$4.70}$	$7\overline{)\$22.96}$	$9\overline{)\$57.60}$
6.	$6\overline{)570}$	$9\overline{)770}$	$7\overline{)\$3.80}$	$8\overline{)\$12.75}$

How Well Can You Divide?

This page will help you make sure of what you've learned about division.

Can you divide with one-figure divisors?

	a	*b*	*c*	*d*
1.	$4\overline{)304}$	$7\overline{)413}$	$9\overline{)774}$	$5\overline{)490}$
2.	$3\overline{)804}$	$4\overline{)3572}$	$6\overline{)1182}$	$8\overline{)21560}$

Can you find two-figure quotients?

3.	$23\overline{)874}$	$52\overline{)3276}$	$36\overline{)2052}$	$29\overline{)2001}$
4.	$75\overline{)5550}$	$14\overline{)658}$	$88\overline{)7480}$	$96\overline{)4704}$

Can you find three-figure quotients?

5.	$21\overline{)9597}$	$43\overline{)10922}$	$76\overline{)10488}$	$57\overline{)26676}$
6.	$84\overline{)34692}$	$39\overline{)7566}$	$99\overline{)37125}$	$18\overline{)9702}$

Can you divide with zeros in the quotient?

7.	$34\overline{)1020}$	$76\overline{)4560}$	$90\overline{)5400}$	$15\overline{)9120}$
8.	$56\overline{)11592}$	$80\overline{)24720}$	$48\overline{)9120}$	$66\overline{)50160}$

Can you divide with final remainders?

9.	$34\overline{)2350}$	$73\overline{)2044}$	$67\overline{)3250}$	$93\overline{)4700}$
10.	$68\overline{)20100}$	$27\overline{)7300}$	$12\overline{)3500}$	$59\overline{)47575}$

Can you divide with three-figure divisors?

11.	$408\overline{)23664}$	$900\overline{)10800}$	$135\overline{)6345}$	$560\overline{)10640}$
12.	$741\overline{)66895}$	$340\overline{)53720}$	$247\overline{)44500}$	$600\overline{)65000}$

Can you divide dollars and cents?

13.	$9\overline{)\$8.01}$	$12\overline{)\$7.80}$	$43\overline{)\$70.52}$	$50\overline{)\$70.00}$
14.	$29\overline{)\$75.50}$	$109\overline{)\$41.60}$	$700\overline{)\$42.00}$	$38\overline{)\$80.00}$

Can You Find Mistakes?

Check each example below to find whether the answer is right or wrong. If it is right, write R on your paper. If it is wrong, find and write the correct answer.

Add.

	a	*b*	*c*	*d*
1.	479 66 1857 970 48 3420	7356 13406 595 34723 9374 65464	$171.50 4.63 508.78 97.25 226.94 $909.00	$552.25 75.00 7.95 1590.78 248.10 $2474.08

Subtract.

2.	1374 478 896	8091 7419 688	$54.02 23.08 $31.94	$125.00 93.25 $ 31.75

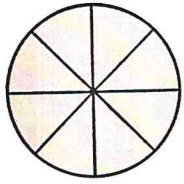
Multiply.

3.	375 294 1500 3285 750 109350	608 509 5472 3040 35872	$6.90 1 80 53 20 690 $643.20	$17.95 67 125 65 1077 0 $1202.65

Divide.

4.	75 16)1200 112 80 80	56 39)19734 195 234 234	39 r 20 57)22250 171 515 513 20	$2.09 275)$574.75 550 24 75 24 75

Understanding Fractions



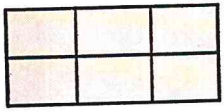
1. Bill saw a chocolate layer cake on the counter of the school cafeteria. The circle at the left shows how the cake was divided.

Into how many equal pieces is the cake divided? What fraction of the cake is each piece? How many eighths are there in $\frac{1}{2}$ of the cake? $\frac{1}{2} = \frac{?}{8}$

Suppose Bill and Tony each buy a piece of the cake. What fraction of the cake will they have? $\frac{2}{8} = \frac{?}{4}$

2. The circle will help you find the missing numerators (the numbers above the line) in these fractions.

$\frac{1}{4} = \frac{?}{8}$ $\frac{3}{4} = \frac{?}{8}$ $\frac{1}{2} = \frac{?}{4}$ $\frac{4}{8} = \frac{?}{2}$ $\frac{6}{8} = \frac{?}{4}$

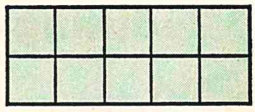


3. Into how many equal parts is the rectangle at the left divided? What fraction of the rectangle is each part? How many sixths are there in $\frac{1}{2}$ of the rectangle? $\frac{1}{2} = \frac{?}{6}$

4. Find the missing numerators for the fractions below.

$\frac{1}{3} = \frac{?}{6}$ $\frac{2}{3} = \frac{?}{6}$ $\frac{3}{6} = \frac{?}{2}$ $\frac{2}{6} = \frac{?}{3}$ $\frac{4}{6} = \frac{?}{3}$

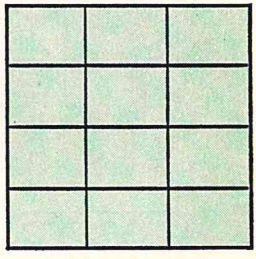
5. Into how many equal parts is the rectangle at the right divided? What fraction of the rectangle is each part? How many tenths are there in $\frac{1}{2}$ of the rectangle? $\frac{1}{2} = \frac{?}{10}$



6. Find the missing numerators.

$\frac{1}{5} = \frac{?}{10}$ $\frac{2}{5} = \frac{?}{10}$ $\frac{3}{5} = \frac{?}{10}$ $\frac{4}{5} = \frac{?}{10}$ $\frac{5}{10} = \frac{?}{2}$

7. Into how many equal parts is this square divided? What fraction of the square is each part? How many twelfths are there in $\frac{1}{2}$ of the square? $\frac{1}{2} = \frac{?}{12}$



8. Find the missing numerators.

$\frac{1}{4} = \frac{?}{12}$ $\frac{3}{4} = \frac{?}{12}$ $\frac{1}{3} = \frac{?}{12}$ $\frac{2}{3} = \frac{?}{12}$

9. Look at the circle in Example 1 on page 58. Which fraction is larger, $\frac{1}{8}$ or $\frac{1}{4}$? Which is largest: $\frac{1}{8}$, $\frac{4}{8}$, or $\frac{6}{8}$?

10. Look at the rectangle in Example 3. Which is largest: $\frac{1}{3}$, $\frac{1}{2}$ or $\frac{1}{6}$?

11. Look at the rectangle in Example 5. Which is larger, $\frac{1}{5}$ or $\frac{1}{10}$? Which is largest: $\frac{5}{10}$, $\frac{1}{10}$, or $\frac{4}{10}$?

12. Look at the square in Example 7. Which fraction is larger, $\frac{1}{4}$ or $\frac{1}{3}$? Which is largest: $\frac{3}{12}$, $\frac{6}{12}$, or $\frac{4}{12}$?

In any fraction, $\frac{2}{3}$ for instance, the number below the line (3) is the **denominator**. It tells the number of equal parts into which a thing has been divided. The number above the line (2) is the **numerator**. It tells the number of these parts you are talking about.

13. If fractions have the same **numerator**, such as 1, is the fraction with the largest **denominator** the largest or smallest fraction?

14. If fractions have the same **denominator**, is the fraction with the largest **numerator** the largest or smallest?

Reducing Fractions in Quotients

1. Sam's father bought 10 small candy bars at the circus. He wanted to divide them among the 8 boys in the party. To find how many bars each boy should get, divide 10 by 8.

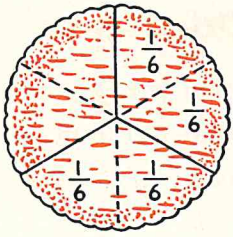
$$8\overline{)10} \qquad 1\tfrac{2}{8} = 1\tfrac{1}{4}$$

Each boy gets $1\frac{2}{8}$ bars. Look at the picture of the candy bar. Two eighths of the bar is the same as $\frac{1}{4}$ of the bar. $\frac{2}{8} = \frac{1}{4}$. Each boy gets $1\frac{1}{4}$ bars.

In the fraction $\frac{2}{8}$, the denominator (8) tells *the number of equal parts into which the bar is divided.* The numerator (2) tells *how many of these parts each boy gets.*

The numerator and denominator are the **terms** of a fraction. Changing $\frac{2}{8}$ to $\frac{1}{4}$ is called **reducing** the fraction to **lowest terms.** Do you see how this is done? Both terms of the fraction, 2 and 8, are divided by the same number, 2. Reducing $\frac{2}{8}$ to $\frac{1}{4}$ does not change the **value** of the fraction, it only makes the **terms** smaller.

2. The drawing of the candy bar will help you reduce $\frac{4}{8}$ to $\frac{1}{2}$. By what number were both terms of $\frac{4}{8}$ divided? Reduce $\frac{6}{8}$ to lowest terms. Reduce $\frac{2}{4}$.



$2\frac{4}{6} = 2\frac{2}{3}$

$6\overline{)16}$

3. At a picnic, there were 16 cookies to be divided among 6 girls. Divide 16 by 6. Each girl should get $2\frac{4}{6}$ cookies. The drawing at the left shows that $\frac{4}{6}$ of a cookie is the same as $\frac{2}{3}$ of a cookie. Each girl gets $2\frac{2}{3}$ cookies. To check, multiply 2×6 and add the remainder, 4.

Reduce these fractions to lowest terms. $\frac{2}{6} = ?$ $\frac{3}{6} = ?$ $\frac{4}{6} = ?$

4. The Lanes used 9 gallons of gasoline in driving their car 168 miles. Find how many miles they averaged per gallon of gasoline by dividing 168 by 9. Write the remainder as a fraction in the quotient and reduce the fraction to lowest terms.

5. Don has a strip of wood 65 inches long which he wants to cut into 10 garden markers, all the same length. How many inches long will each marker be?

Reduce each of the following fractions to lowest terms.

	a	b	c	d	e
6.	$\frac{3}{9} = ?$	$\frac{6}{9} = ?$	$\frac{6}{10} = ?$	$\frac{4}{10} = ?$	$\frac{5}{10} = ?$
7.	$\frac{8}{12} = ?$	$\frac{6}{12} = ?$	$\frac{9}{12} = ?$	$\frac{8}{16} = ?$	$\frac{12}{16} = ?$
8.	$\frac{6}{16} = ?$	$\frac{8}{24} = ?$	$\frac{12}{36} = ?$	$\frac{10}{60} = ?$	$\frac{30}{60} = ?$

Copy and divide. Reduce each fraction in the quotient to lowest terms.

9.	$4\overline{)10}$	$4\overline{)30}$	$6\overline{)28}$	$8\overline{)36}$	$9\overline{)33}$
10.	$8\overline{)54}$	$6\overline{)39}$	$9\overline{)93}$	$8\overline{)98}$	$12\overline{)18}$
11.	$10\overline{)25}$	$10\overline{)34}$	$12\overline{)28}$	$60\overline{)80}$	$60\overline{)90}$
12.	$10\overline{)48}$	$50\overline{)80}$	$24\overline{)36}$	$15\overline{)35}$	$25\overline{)60}$

Changing Measures

1. Which unit of length is larger, a foot or a yard?
2. Which unit of weight is larger, a pound or an ounce?

Tell which unit of measure is larger in each pair.

	a	*b*
3.	A quart or a gallon	A ton or a pound
4.	A week or a day	An hour or a minute
5.	A year or a month	An inch or a foot
6.	A pint or a quart	A bushel or a peck

7. Joe is going to practice on his trumpet 4 hours this week. How many minutes should he practice? Do you multiply by 60, or divide by 60, to change hours to minutes? Which unit of time is larger?

8. Sue and her mother want to make enough tomato juice to fill 16 quart jars. How many gallons should they make? Do you multiply by 4 or divide by 4 to change quarts to gallons? Which unit of measure is larger?

9. To change a smaller unit of measure into a larger unit, do you multiply or divide? To change a larger unit of measure into a smaller unit, do you multiply or divide?

Copy and fill in the missing numbers.

	a	*b*	*c*
10.	2 gal. = ? qt.	28 da. = ? wk.	4 lb. = ? oz.
11.	3 bu. = ? qt.	120 min. = ? hr.	27 ft. = ? yd.
12.	24 mo. = ? yr.	2 tons = ? lb.	3 yd. = ? in.
13.	4 min. = ? sec.	12 qt. = ? pt.	16 pk. = ? bu.
14.	2 da. = ? hr.	2 mi. = ? yd.	32 oz. = ? lb.

15. This week, Nancy has practiced on the piano 3 hr. 20 min. How many minutes has she practiced? 3 hr. 20 min. = ? min.

16. Bill is 4 feet 5 inches tall. He wants to know whether he is taller than Tony, who is 52 inches tall. You can find out by changing 4 ft. 5 in. to inches. Or you can change 52 inches to feet and inches. Which boy is taller? How much taller?

Copy and fill in the missing numbers.

	a	*b*
17.	5 ft. 3 in. = ? in.	3 lb. 9 oz. = ? oz.
18.	6 qt. 1 pt. = ? pt.	2 min. 40 sec. = ? sec.
19.	10 qt. = ? gal. ? qt.	200 min. = ? hr. ? min.
20.	40 oz. = ? lb. ? oz.	40 in. = ? ft. ? in.
21.	3 yd. 16 in. = ? in.	30 hr. = ? da. ? hr.

22. Bob's hens laid 9 eggs today. What part of a dozen eggs did he have? 9 eggs $= \frac{9}{12}$ dozen eggs. Here the fraction $\frac{9}{12}$ shows that 9 has been divided by 12. Reduce $\frac{9}{12}$ to lowest terms.

23. Jill helped her mother 40 minutes today. What part of an hour is 40 minutes? $\frac{40}{60} = ?$

24. Sally bought 24 inches of lace. What part of a yard is 24 inches? $\frac{24}{36} = ?$

25. A bar or stick of butter weighs 4 ounces. What part of a pound is one bar?

26. How many pounds are 40 ounces of hamburger? $40 \div 16 = 2\frac{8}{16} = ?$ lb.

Find the missing numbers. Reduce fractions to lowest terms.

	a	*b*	*c*
27.	30 in. = ? yd.	12 oz. = ? lb.	45 min. = ? hr.
28.	18 in. = ? ft.	15 mo. = ? yr.	10 qt. = ? gal.

Can You Arrange Numbers in Order?

1. Write \$8.78, \$10, \$1.09, 95¢, and \$14.50 in the order of their value, starting with the largest and ending with the smallest.

2. Write 12°, −6° (6° below zero), 10°, 6°, −10° in order, from the warmest to the coldest.

3. Arrange IX, XIV, XXVI, XXX, XVIII, in the order of their value, starting with the smallest.

4. Write the heights 4 ft. 11 in., 5 ft. 7 in., 5 ft., 4 ft. 9 in., and 5 ft. 2 in., in order, from the tallest to the shortest.

5. Arrange the fractions $\frac{5}{8}$, $\frac{1}{8}$, $\frac{7}{8}$, and $\frac{3}{8}$ in the order of their size, starting with the largest.

6. Write $\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{3}$, and $\frac{1}{4}$ in the order of their size, starting with the smallest.

7. Write these numbers in figures in the order of their size, the largest first: nine hundred ten, one thousand nine hundred, nine hundred ninety, nine hundred nine, nine hundred nineteen.

Can You Find the Missing Numbers?

In each of these examples, the numbers are arranged in a certain order. So, in Example 1, 2 is added each time. Some numbers have been left out. Copy each series and fill in the missing numbers.

1. 1, 3, 5, ?, 9, ?, ?, 15

2. 6, 8, 10, ?, 14, ?, 18, ?

3. 15, 14, 13, 12, ?, 10, ?, ?, 7

4. 25, 23, 21, 19, ?, 15, ?, ?

5. 1, 4, 7, 10, ?, 16, ?, 22

6. 1, 2, 4, 8, ?, 32, ?, 128

Comparing Numbers

You can compare numbers in several ways. You can *subtract* to find how much larger or smaller one number is than another. You can *divide* to find how many times one number is, compared to another number. You can find what part or *fraction* one number is of another. When you find what part one number is of another, always reduce the fraction to lowest terms.

See how many of the problems on this page you can do as quickies.

1. In their first game, Bill's baseball team made 2 runs. In their second game they made 8 runs. How many times as many runs did they make in the second game as in the first game? How many more runs did they get?

2. Don sold a watermelon for 50 cents and a squash for 10 cents. How many times as much did he get for the watermelon as for the squash? How much more did he get?

3. Sue made 12 cupcakes. She covered 8 of them with chocolate icing. What fractional part of the cakes did she cover with chocolate? $\frac{8}{12} = ?$

4. Don picked 15 quarts of cherries. He got 5 quarts for picking them. What part of the 15 quarts did he get?

5. Bill's team played 10 games. They won 6 games. What part of their games did they win?

6. Bill bought a pair of baseball shoes for \$5, a bat for \$3, and a glove for \$7.

a. What part of the total cost was the cost of the shoes?

b. What part of the total was the cost of the bat?

c. How many times as much as the bat did the shoes and glove cost together?

Using Number Comparisons

1. Sam is paid 40 cents an hour for weeding the garden. Today he worked 45 minutes. To find how much Sam earned, you first find that 45 minutes are $\frac{45}{60}$ or $\frac{3}{4}$ of an hour. Then you find $\frac{3}{4}$ of 40 cents. One-fourth of 40 is 10, so $\frac{3}{4}$ of 40 = 3 × 10, or ? cents.

2. At 40 cents an hour, how much will Sam get for working 30 minutes?

3. If eggs are selling for 60 cents a dozen, how much should Bob get for 6 eggs? How much for 3 eggs? For 9 eggs?

4. When rolls are 48 cents a dozen, how much must Sally pay for 6 rolls? For 3 rolls? For 9 rolls?

5. If cheese is 80 cents a pound, how much should 4 ounces of cheese cost? 8 ounces of cheese? 12 ounces of cheese?

6. If plums are 3 for 5 cents, how much will 6 plums cost? (6 plums are 2 times 3 plums; so 6 plums will cost 2 × 5 cents.)

7. Cupcakes are 4 for 15 cents. How many cupcakes can Linda buy for 30 cents? (30¢ is how many times 15¢? Then how many times 4 cupcakes can she get?)

8. When apples are 3 for 10 cents, how much will 12 apples cost?

Do You Know Arithmetic Words?

1. You add to find the sum. What process do you use to find the quotient?

2. What process do you use to find the product?

3. What two words mean the answer in subtraction?

4. What does the sign ÷ tell you to do?

5. The number you multiply by is called the multiplier. What is the number you divide by called?

6. What does "plus" tell you to do?

7. What does "minus" tell you to do?

8. In the fraction $\frac{5}{8}$, what is the numerator? What is the denominator?

9. What is the name of a quarter of a gallon?

10. What is another name for one third of a yard?

11. What word means 16 ounces?

12. What word means 60 minutes?

13. What word means 32 quarts?

14. What word means twice a pint?

15. What is another word for 2000 pounds?

Can You Fill in the Missing Signs?

Copy the examples below and fill in the correct sign (+, −, ×, ÷) for each question mark.

	a	*b*	*c*	*d*
1.	12 ? 3 = 4	12 ? 3 = 36	12 ? 3 = 9	12 ? 3 = 15
2.	20 ? 4 = 16	20 ? 4 = 5	20 ? 4 = 80	20 ? 4 = 24
3.	30 ? 6 = 36	30 ? 6 = 180	30 ? 6 = 24	30 ? 6 = 5
4.	16 ? 8 = 2	16 ? 8 = 24	16 ? 8 = 8	6 ? 8 = 48
5.	45 ? 9 = 54	45 ? 9 = 5	45 ? 9 = 36	56 ? 8 = 7

Making Up Problems

See if you can make up problems of your own as suggested on this page. Write your problems plainly and use reasonable numbers, so that your classmates can work your problems. Put your problems with those made up by the rest of the class. Then draw out a set of some other pupil's problems and work them.

1. Make up a multiplication problem about how much you must pay for several things, such as doughnuts.

2. Make up a subtraction problem about how many inches you have grown in the last year.

3. Make up an addition problem about buying two things you would like to have.

4. Make up a division problem about how much each thing costs when you buy several things, such as apples.

5. Make up a subtraction problem about saving money to buy something you want.

6. Make up a division problem about how many miles an hour you averaged on a trip in a car. (See if you can make the answer come out exactly—without a remainder.)

7. Make up an addition problem about how many boys and girls went on a picnic.

8. Make up a subtraction problem about how much change you received when you bought something at the store.

9. Make up a multiplication problem about earning money by working for several hours.

10. Make up a subtraction problem about sawing off a piece of board to make something.

Pages 272 and 273 provide enrichment material which can be used after this page.

Can You Compute?

Diagnostic Check Test 1A

On the next three pages are three tests that will show you how much arithmetic you have learned.

This is the first test. It will help you find out how much you know about the four processes. Copy the examples carefully and make sure your answers are correct.

Copy, subtract, and check.

	a	*b*	*c*	*d*
1.	3681 3592	13059 9080	\$20.00 6.95	6 ft. 4 ft. 10 in.

Copy, add, and check.

2.	755 879 636 607 563	6724 958 2609 67 813	\$ 8.07 16.50 7.49 58.35 .92	7 lb. 7 oz. 4 lb. 13 oz. 2 lb. 14 oz.

Copy, multiply, and check.

3.	97 58	809 29	687 306	\$9.50 74

Copy, divide, and check.

4. $36\overline{)9720}$ $12\overline{)5767}$ $600\overline{)4800}$ $48\overline{)\$41.28}$

Copy each of the following examples and do what the sign tells you to do.

5. \$32 − \$19.68

6. 45 × \$8.60

7. \$54.50 ÷ 26

8. 150 × 508

9. 58 + 1346 + 86 + 849

10. \$107.50 + \$89.85 + \$5.79

11. 6 ft. 2 in. − 4 ft. 9 in.

12. 3 lb. 8 oz. + 4 lb. 12 oz.

Do You Understand Numbers?

Diagnostic Check Test 1B

This test will show you how much you know about what numbers mean and how they are related.

1. Round off 29,524 to the nearest thousand.
2. Write three billion dollars in figures.
3. In the number 3746, what value has the figure 7?
4. Write the number that means 130 thousands, 6 hundreds, 2 tens, no units.
5. Which is longer, 5 ft. or 50 in.?
6. Reduce $\frac{8}{12}$ to lowest terms.
7. What part of a pound = 12 oz.?
8. Write XCI in our numbers.
9. A foot is how many times as long as 3 inches?
10. What word means 24 hours?
11. What is another name for 1760 yards?
12. What coin is a tenth of a dollar?
13. What unit of measure is twice a pint?
14. Sixteen is how much more than 9?
15. Forty is how many times as large as 8?
16. How many 7's are there in 63?
17. What number is 5 less than 11?
18. What is the product of 8 and 4?
19. What is the difference between 4608 and 3779?
20. Which fraction is largest, $\frac{1}{3}$, $\frac{1}{2}$, or $\frac{1}{6}$?
21. Write the two subtraction facts that go with $8+7=15$.
22. Write the two division facts that go with $7\times8=56$.
23. Write the multiplication fact that goes with $64\div8=8$.

Can You Use Arithmetic?

Diagnostic Check Test 1C

This test will show you how much you have learned about using arithmetic processes in problems.

1. Ellen made 20 glasses of lemonade for 8 people at her party. How many glasses were there for each guest?

2. Don's father gave him 1 cent for every nail he pulled out of some old boards. Don pulled out 162 nails. How much money did he earn?

3. Mrs. Lane bought a piece of meat weighing 3 lb. 12 oz. How many ounces less than 4 lb. of meat did she buy?

4. Today, two loads of coal were brought to our house. There were 6950 pounds of coal in the first load and 7450 pounds in the second load. How many pounds of coal did we get?

5. Mrs. Lane wants to buy 15 boxes of raspberries to make into jam. At 45¢ a box, how much must she pay?

6. Jean has saved 130 pennies. She wants to change them into dimes to put in her dime bank. How many dimes should she get?

7. The Lanes have started on a 913-mile trip. They have driven 396 miles. Estimate how many miles they still have to drive. Then find the exact number.

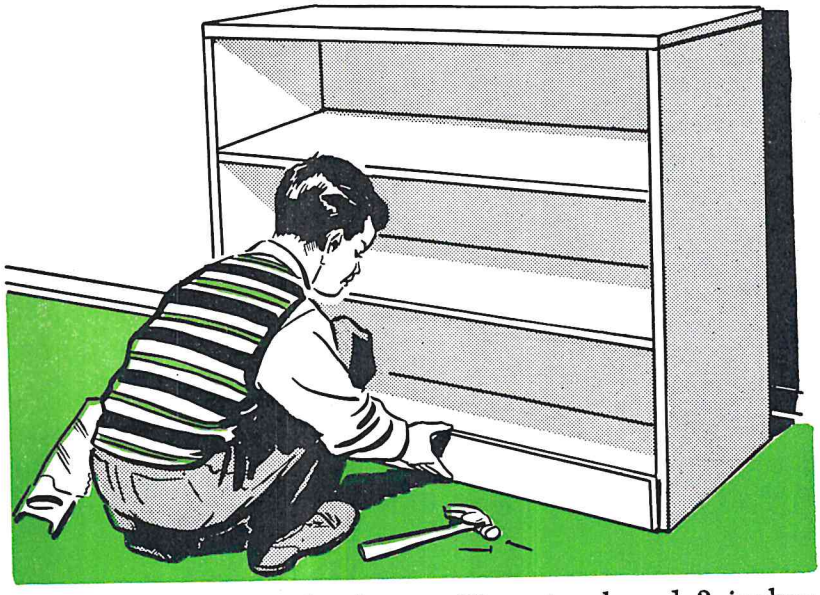
8. Peggy bought some ice skates for $6.98 and a sweater for $3.27. How much did she spend in all?

9. If cheese is 72 cents a pound, how much should Sally pay for 4 ounces of cheese at that rate?

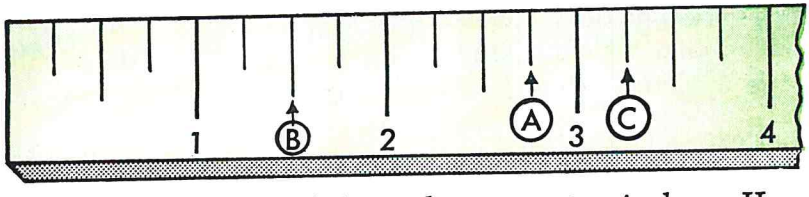
10. At 2 for 5¢, how much will 6 apples cost?

Look over your work. Are your answers reasonable?

Using a Ruler

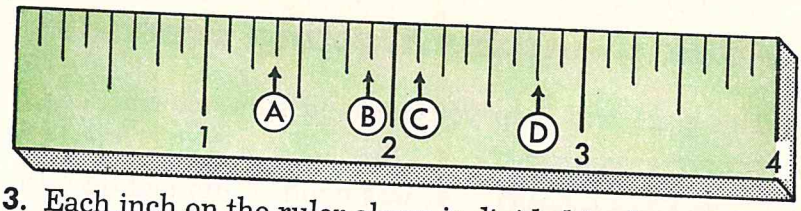


Dick is making a bookcase. He cut a board 3 inches wide to go along the bottom. When he started to put the bookcase together, he found that the board was $\frac{1}{4}$ inch too wide. Look at the drawing of the ruler below. Arrow A points to $2\frac{3}{4}$ inches, the width the board should be.



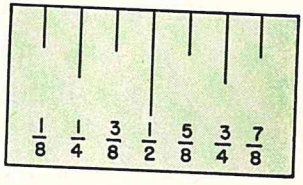
1. This ruler is divided to show quarter inches. How many inches does Arrow B point to? How many inches does Arrow C show?

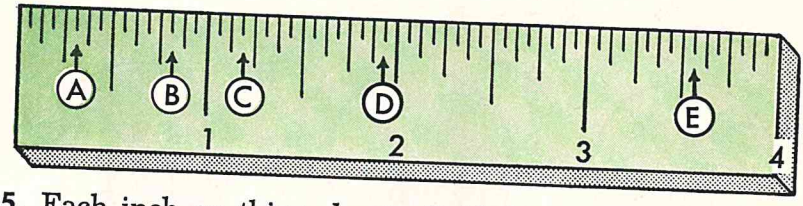
2. The ruler will help you count by fourths. Start: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, and count by fourths to 4.



3. Each inch on the ruler above is divided to show eighths. Arrow A points to $1\frac{3}{8}$ inches. How many inches does Arrow B show? Arrow C? Arrow D? Which line on the ruler shows $3\frac{7}{8}$ inches?

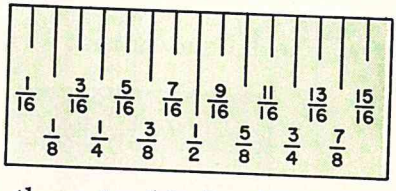
4. The enlarged picture of an inch at the right will help you count by eighths. Start: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, and count to 3.





5. Each inch on this ruler is divided into 16 equal parts to show sixteenths. Arrow A points to $\frac{5}{16}$ inch. How many sixteenths does Arrow B point to? How many inches does Arrow C show? Arrow D? Arrow E?

6. The enlarged inch at the right will help you count by sixteenths. Start: $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, and count to 2.

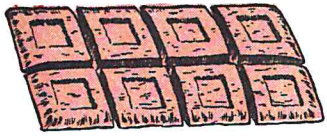


7. How many sixteenths are there in $\frac{1}{2}$? In $\frac{1}{4}$? In $\frac{1}{8}$? In $\frac{3}{4}$? In $\frac{3}{8}$? In $\frac{5}{8}$? In $\frac{7}{8}$?

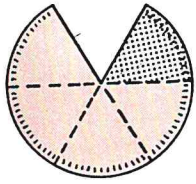
8. Draw on the blackboard, or on your paper, a line you think is $7\frac{3}{4}$ in. long. Then measure it with your ruler. How close did you come?

Adding and Subtracting Fractions

This page will help you add and subtract fractions.

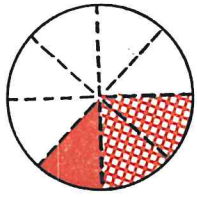


1. Jim bought a chocolate bar. It was divided into eighths. Jim ate $\frac{3}{8}$ of the bar. He gave $\frac{1}{8}$ of the bar to his little sister. To find what fraction of the bar was gone, add $\frac{3}{8}$ and $\frac{1}{8}$, and reduce the sum to lowest terms. $\frac{3}{8} + \frac{1}{8} = \frac{4}{8} = ?$

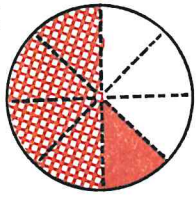


2. Jill's mother had $\frac{5}{6}$ of a pie. She let Jill eat $\frac{1}{6}$ of the pie; $\frac{1}{6}$ is shaded to show that Jill ate it. To find what fraction of the pie was left, subtract $\frac{1}{6}$ from $\frac{5}{6}$. $\frac{5}{6} - \frac{1}{6} = \frac{4}{6} = ?$

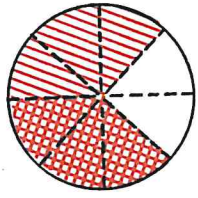
I



II



III

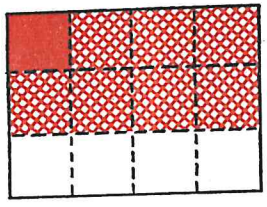


3. Circle I is marked to show that $\frac{3}{8} - \frac{1}{8} = \frac{2}{8} = ?$

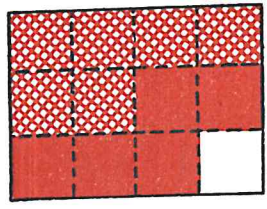
4. Circle II shows that $\frac{5}{8} - \frac{1}{8} = \frac{4}{8} = ?$

5. Circle III shows that $\frac{3}{8} + \frac{3}{8} = \frac{6}{8} = ?$

IV



V



6. Rectangle IV shows that $\frac{1}{12} + \frac{7}{12} = \frac{8}{12} = ?$

7. Rectangle V shows that $\frac{11}{12} - \frac{5}{12} = \frac{6}{12} = ?$

Adding Similar Fractions

1. Don divided his garden into 12 equal parts. He planted $\frac{5}{12}$ of his garden in sweet corn and $\frac{1}{12}$ in tomatoes. To find what part of his garden Don planted in corn and tomatoes, what do you do?

Fractions with the same denominator, like $\frac{5}{12}$ and $\frac{1}{12}$, are called **similar fractions**. To add similar fractions, add the numerators, and, if you can, reduce the answer to lowest terms. $\frac{5}{12} + \frac{1}{12} = ?$

What fraction of his garden did Don plant in corn and tomatoes?

2. Sue used $\frac{1}{3}$ cup of white sugar and $\frac{1}{3}$ cup of brown sugar in making gingerbread. How much sugar did she use?

Copy and add. All answers should be in lowest terms.

	a	*b*	*c*	*d*
3.	$\frac{1}{4} + \frac{1}{4} = ?$	$\frac{1}{6} + \frac{1}{6} = ?$	$\frac{1}{10} + \frac{1}{10} = ?$	$\frac{1}{8} + \frac{1}{8} = ?$
4.	$\frac{1}{5} + \frac{3}{5} = ?$	$\frac{3}{8} + \frac{1}{8} = ?$	$\frac{1}{8} + \frac{5}{8} = ?$	$\frac{1}{9} + \frac{4}{9} = ?$
5.	$\frac{3}{10} + \frac{1}{10} = ?$	$\frac{1}{12} + \frac{1}{12} = ?$	$\frac{5}{12} + \frac{5}{12} = ?$	$\frac{1}{12} + \frac{7}{12} = ?$

Subtracting Similar Fractions

1. Sally is going to the store to buy some groceries for her mother. It is $\frac{3}{4}$ mile from Sally's home to the store. Sally has walked $\frac{1}{4}$ mile. How much farther must she go?

Here you subtract similar fractions by subtracting the numerators. $\frac{3}{4} - \frac{1}{4} = ?$

Copy and subtract. Answers must be in lowest terms.

	a	*b*	*c*	*d*
2.	$\frac{5}{6} - \frac{1}{6} = ?$	$\frac{7}{8} - \frac{3}{8} = ?$	$\frac{5}{8} - \frac{1}{8} = ?$	$\frac{9}{10} - \frac{3}{10} = ?$
3.	$\frac{7}{12} - \frac{5}{12} = ?$	$\frac{11}{12} - \frac{7}{12} = ?$	$\frac{11}{16} - \frac{3}{16} = ?$	$\frac{13}{16} - \frac{9}{16} = ?$

Which Process Do You Use?

These problems do not have any numbers, so you don't have to work them. Number your paper 1 to 17. Read each problem carefully and decide which process you would use to solve it. Write **add**, **subtract**, **multiply**, or **divide** on your paper after the number of the problem. If you are not sure which process to use, thinking with numbers may help you.

1. If you know the price of a bicycle and how much money you have saved toward buying it, how do you find how much money you still need?

2. Bill knows how many miles he rode on a bicycle trip and how many hours it took him. How can he find how many miles an hour he rode on the average?

3. Don knows how many quarts of strawberries he has to sell. He knows how much he can get for each quart. How can he find how much all his strawberries are worth?

4. You know how many days there are in a year and how many days there are in a week. How do you find how many weeks there are in a year?

5. Jill wants to buy a dress and a coat. She knows the price of each. How does she find the total cost?

6. Joe knows the time he started to practice his trumpet lesson and when he stopped practicing. How can he find how long he practiced?

7. You know how much a trip cost and how many people are sharing the expense equally. How do you find how much each one should pay?

8. Suppose you know how much money you have now and how much money you are going to spend. How do you find how much money you will have left?

9. If you know how many miles an hour an airplane flies and how many hours it has been flying, how do you find how many miles it has gone?

10. You know the time a bus is due. You know how many minutes late it is. How do you find when the bus will come?

11. You know how many pounds you weigh and how many pounds your father weighs. How do you find how much heavier your father is than you are?

12. Bill knows how many miles an hour he can ride on his bicycle. He knows how many miles long a certain trip is. How does he find how many hours it will take him to make the trip?

13. You know how much money you had when you went into a store and how much you had when you came out. How do you find how much you spent?

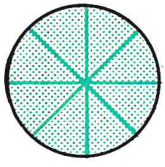
14. You know how many miles a car can go on one gallon of gasoline and how many gallons of gasoline the car's tank holds. How do you find how far a tankful of gasoline will take the car?

15. Sue knows how many gallons of tomato juice she and her mother have made. How can she find how many quart jars they will need to put it in?

16. If you know the date on which you were born, how do you find how old you are now?

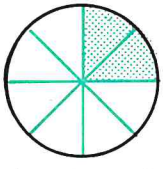
17. You know how many miles you have gone on a trip and how many gallons of gasoline you used. How do you find how many miles per gallon your car can go?

Fractions and Mixed Numbers



Sue and her mother made 2 layer cakes for a picnic. Each cake was cut into 8 equal slices. At the picnic, 10 children asked Sue for slices of the cakes. The cakes at the left are shaded to show that Sue took 1 whole cake and $\frac{2}{8}$ or $\frac{1}{4}$ of another cake to get the 10 slices.

$$\frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4}$$



$1\frac{1}{4}$ is called a mixed number. It is a whole number and a fraction.

If the numerator of a fraction is larger than the denominator, the fraction can be changed to a mixed number by dividing the numerator by the denominator.

1. The picture of the cakes will help you change these fractions to mixed numbers.

$\frac{9}{8} = ?$ $\frac{13}{8} = ?$ $\frac{12}{8} = ?$ $\frac{11}{8} = ?$ $\frac{14}{8} = ?$

Change these fractions to mixed numbers in lowest terms.

	a	*b*	*c*	*d*	e	*f*
2.	$\frac{5}{4}$	$\frac{6}{4}$	$\frac{9}{4}$	$\frac{10}{4}$	$\frac{11}{4}$	$\frac{3}{2}$
3.	$\frac{4}{3}$	$\frac{8}{6}$	$\frac{9}{6}$	$\frac{10}{6}$	$\frac{13}{8}$	$\frac{12}{10}$
4.	$\frac{15}{10}$	$\frac{18}{10}$	$\frac{15}{12}$	$\frac{16}{12}$	$\frac{18}{16}$	$\frac{20}{12}$

Adding Mixed Numbers

1. Last Saturday, Tony helped his father wax the car. He worked $2\frac{1}{2}$ hours in the morning and $1\frac{1}{2}$ hours in the afternoon. What do we do to find how many hours he worked?

$$\begin{array}{r} 2\frac{1}{2} \\ 1\frac{1}{2} \\ \hline 4 \end{array}$$

Add the fractions first: $\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$. Carry the 1 and add it to the whole numbers. How long did Tony work?

Fractions like $\frac{2}{2}$, $\frac{10}{8}$, and $\frac{7}{4}$ are called **improper fractions.** An **improper fraction** is a fraction whose numerator is *equal to* or *larger than* its denominator.

Copy and add. Change the improper fractions in the answers to whole numbers or mixed numbers in lowest terms.

	a	*b*	*c*	*d*	*e*	*f*
2.	$\frac{3}{8}$ $\frac{7}{8}$	$\frac{3}{4}$ $\frac{3}{4}$	$\frac{2}{3}$ $\frac{2}{3}$	$\frac{7}{10}$ $\frac{3}{10}$	$\frac{1}{12}$ $\frac{11}{12}$	$\frac{9}{10}$ $\frac{7}{10}$
3.	$1\frac{5}{8}$ $1\frac{5}{8}$	$1\frac{3}{4}$ $2\frac{1}{4}$	$2\frac{5}{8}$ $1\frac{7}{8}$	$3\frac{1}{6}$ $2\frac{5}{6}$	$1\frac{1}{2}$ $5\frac{1}{2}$	$7\frac{5}{8}$ $2\frac{1}{8}$
4.	$3\frac{7}{10}$ $3\frac{9}{10}$	$4\frac{3}{10}$ $2\frac{7}{10}$	$2\frac{11}{12}$ $\frac{7}{12}$	$5\frac{5}{12}$ $4\frac{9}{12}$	$4\frac{9}{16}$ $3\frac{3}{16}$	$6\frac{13}{16}$ $4\frac{15}{16}$

Subtracting Mixed Numbers

$$10\tfrac{3}{8} = 9\tfrac{11}{8}$$
$$1\tfrac{5}{8} = 1\tfrac{5}{8}$$
$$8\tfrac{6}{8}$$
$$= 8\tfrac{3}{4}$$

1. Sally's mother bought a ham weighing $10\frac{3}{8}$ lb. She had the clerk cut off a slice weighing $1\frac{5}{8}$ lb. to cook for dinner. To find how many pounds the rest of the ham weighed, subtract.

You cannot subtract $\frac{5}{8}$ from $\frac{3}{8}$, so borrow 1 from 10, change it to $\frac{8}{8}$, and then add $\frac{8}{8}$ to $\frac{3}{8}$. $10\frac{3}{8} = 9\frac{11}{8}$. Now you can subtract $1\frac{5}{8}$ from $9\frac{11}{8}$. How much did the rest of the ham weigh?

Copy these examples and fill in the missing numerators.

	a	*b*	*c*	*d*
2.	$1\frac{1}{3} = \frac{?}{3}$	$1\frac{1}{6} = \frac{?}{6}$	$1\frac{5}{8} = \frac{?}{8}$	$2\frac{1}{8} = 1\frac{?}{8}$
3.	$3\frac{1}{4} = 2\frac{?}{4}$	$5\frac{1}{3} = 4\frac{?}{3}$	$6\frac{3}{10} = 5\frac{?}{10}$	$4\frac{5}{12} = 3\frac{?}{12}$

Copy and subtract.

	a	*b*	*c*	*d*	*e*	*f*
4.	$3\frac{4}{5}$ $2\frac{1}{5}$	$8\frac{7}{12}$ $5\frac{1}{12}$	$7\frac{1}{8}$ $3\frac{3}{8}$	$6\frac{2}{5}$ $5\frac{3}{5}$	$7\frac{1}{6}$ $2\frac{5}{6}$	$9\frac{1}{4}$ $8\frac{3}{4}$
5.	$8\frac{3}{10}$ $1\frac{7}{10}$	$9\frac{3}{8}$ $3\frac{7}{8}$	$10\frac{1}{10}$ $4\frac{9}{10}$	$12\frac{1}{12}$ $7\frac{7}{12}$	$15\frac{5}{9}$ $8\frac{7}{9}$	$13\frac{5}{12}$ $6\frac{11}{12}$

Practice in Adding Similar Fractions

Copy and add. Fractions must be in lowest terms.

	a	b	c	d	e	f
1.	$\frac{1}{8}$ $\frac{5}{8}$	$\frac{5}{8}$ $\frac{7}{8}$	$\frac{9}{10}$ $\frac{7}{10}$	$\frac{4}{9}$ $\frac{5}{9}$	$\frac{7}{12}$ $\frac{5}{12}$	$\frac{13}{16}$ $\frac{9}{16}$
2.	$2\frac{1}{8}$ $5\frac{3}{8}$	$1\frac{1}{4}$ $\frac{3}{4}$	$6\frac{7}{8}$ $3\frac{1}{8}$	$4\frac{5}{6}$ $2\frac{5}{6}$	$5\frac{3}{10}$ $8\frac{7}{10}$	$7\frac{1}{2}$ $5\frac{1}{2}$
3.	$4\frac{5}{12}$ $3\frac{11}{12}$	$2\frac{3}{10}$ $\frac{9}{10}$	$7\frac{5}{9}$ $7\frac{7}{9}$	$12\frac{7}{12}$ $9\frac{7}{12}$	$10\frac{9}{16}$ $12\frac{7}{16}$	$8\frac{15}{16}$ $11\frac{11}{16}$
4.	$3\frac{1}{4}$ $5\frac{3}{4}$ $2\frac{3}{4}$	$2\frac{5}{8}$ $\frac{7}{8}$ $1\frac{3}{8}$	$4\frac{3}{10}$ $6\frac{9}{10}$ 5	$3\frac{5}{6}$ $7\frac{5}{6}$ $2\frac{1}{6}$	$6\frac{9}{16}$ $10\frac{11}{16}$ $5\frac{13}{16}$	$10\frac{7}{12}$ $7\frac{11}{12}$ $4\frac{5}{12}$

Subtracting Similar Fractions

Copy and subtract. Some examples are done for you.

	a	b	c	d	e	f
1.	$9\frac{7}{8}$ $2\frac{3}{8}$	$10\frac{9}{10}$ $6\frac{3}{10}$	$12\frac{11}{12}$ $9\frac{7}{12}$	$13\frac{5}{6}$ $8\frac{1}{6}$	$10\frac{13}{16}$ $4\frac{5}{16}$	$11\frac{11}{16}$ $8\frac{9}{16}$
2.	4 $2\frac{1}{4}$ $1\frac{3}{4}$	6 $2\frac{3}{8}$	10 $3\frac{11}{12}$	18 $2\frac{1}{4}$	10 $1\frac{1}{6}$	15 $7\frac{13}{16}$
3.	$11\frac{1}{2}$ 5 $6\frac{1}{2}$	$15\frac{1}{3}$ $6\frac{1}{3}$ 9	$9\frac{3}{4}$ 7	$10\frac{5}{6}$ $4\frac{5}{6}$	$9\frac{1}{8}$ $4\frac{5}{8}$	$10\frac{7}{9}$ $2\frac{8}{9}$
4.	$15\frac{3}{8}$ $7\frac{3}{8}$	$12\frac{1}{5}$ $4\frac{3}{5}$	$7\frac{3}{10}$ $6\frac{9}{10}$	$13\frac{5}{16}$ $8\frac{9}{16}$	$12\frac{11}{12}$ $8\frac{5}{12}$	$16\frac{1}{10}$ $9\frac{9}{10}$

Thinking About Fractions

1. What are the terms of the fraction $\frac{9}{10}$?

2. In the fraction $\frac{11}{16}$, what is the numerator? What is the denominator?

3. What fraction shows that a pie has been divided into 6 equal parts and 5 of these parts are being considered?

4. What kind of fraction is $\frac{11}{8}$?

5. Name three similar fractions.

6. How do you reduce a fraction to lowest terms?

7. How do you change an improper fraction to a whole number or a mixed number?

8. How many eighths are there in a whole cake?

9. How many sixteenths are there in $\frac{1}{4}$ inch?

10. Tell which of the fractions below is equal to $\frac{1}{2}$:
$\frac{8}{12}$, $\frac{4}{8}$, $\frac{6}{16}$, or $\frac{6}{10}$.

11. Of the fractions $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{2}$, and $\frac{1}{4}$, which is the largest? Which is the smallest?

12. Does dividing both terms of a fraction by the same number change the value of the fraction? Prove your answer with an example.

13. Arrange these fractions in the order of their value, the largest first: $\frac{13}{16}$, $\frac{7}{16}$, $\frac{11}{16}$, $\frac{5}{16}$, $\frac{15}{16}$.

14. Change $\frac{12}{8}$ to a mixed number in lowest terms.

$2\frac{5}{6}$	$\frac{5}{4}$	$\frac{5}{8}$	$\frac{8}{10}$	$\frac{4}{5}$	$\frac{11}{12}$	$\frac{1}{8}$	$\frac{8}{9}$

15. From the numbers above, pick out (a) an improper fraction, (b) two similar fractions, (c) a mixed number, (d) a fraction that can be reduced to lower terms.

Page 274 provides enrichment material which can be used after this page.

Making Up Questions for Problems

Finish each of these problems by writing a good question for it. Your question will make it an addition problem, a subtraction problem, a multiplication problem, or a division problem.

Solve each problem and write the answer on your paper after your question. See if the other pupils wrote the same questions and got the same answers.

1. Bob lives $4\frac{3}{10}$ miles north of his school. Don lives $3\frac{9}{10}$ miles south of that school.

2. In the auditorium of Ann's school, there are 14 rows of seats with 28 seats in each row.

3. Bob sold two chickens. One weighed $3\frac{5}{8}$ pounds and the other weighed $4\frac{1}{8}$ pounds.

4. Don's father grows apples. Last fall he picked 1045 bushels of apples in an orchard of 5 acres.

5. Don's father pays Don 35 cents an hour for working in the orchard. One Saturday, Don worked 5 hours.

6. Sally bought $3\frac{5}{8}$ yards of cloth for a dress, and $\frac{5}{8}$ yards of another color for trimming.

7. Sam caught a trout $12\frac{3}{4}$ inches long. His father caught a trout $15\frac{1}{4}$ inches long.

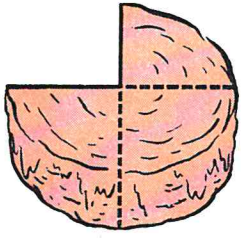
8. An airplane flew 744 miles in 4 hours.

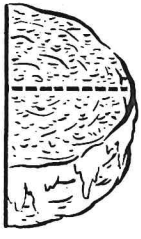
9. When sugar was 10 cents a pound, Jill's mother bought 24 pounds of sugar.

10. Bob's father bought a 5-gallon can of oil for his truck. He has used $2\frac{1}{4}$ gallons of the oil.

11. One year ago, Nora was 4 ft. 5 in. tall. Now she is 56 in. tall.

Changing Fractions To Add Them





1. At a cake sale, Ellen's mother bought $\frac{3}{4}$ of an orange layer cake and $\frac{1}{2}$ of a coconut layer cake for Ellen's party. To find how many cakes she bought in all, add $\frac{3}{4}$ and $\frac{1}{2}$.

Before you add, think of $\frac{1}{2}$ as $\frac{2}{4}$. Then add $\frac{3}{4}$ and $\frac{2}{4}$.

$\frac{3}{4} + \frac{2}{4} = \frac{5}{4} =$? cakes

You cannot add fractions unless they are similar fractions. That is, the fractions must have the same denominator. It is called a **common denominator.**

When you change $\frac{1}{2}$ to $\frac{2}{4}$, you change the fraction to **higher terms** by *multiplying* both numerator and denominator by the same number. $\frac{1}{2} = \frac{2 \times 1}{2 \times 2} = \frac{2}{4}$

2. Change $\frac{3}{4}$ to eighths. Multiply both terms by 2. $\frac{3}{4} = \frac{?}{8}$

3. Change $\frac{1}{4}$ to twelfths. By what number do you multiply both terms? $\frac{1}{4} = \frac{?}{12}$

4. It is $\frac{7}{10}$ of a mile from Ben's house to Dick's house, and $\frac{1}{2}$ mile more from Dick's house to the school. To find how far it is from Ben's house to the school, add $\frac{7}{10}$ mile and $\frac{1}{2}$ mile.

$$\frac{7}{10} = \frac{7}{10}$$
$$\frac{1}{2} = \frac{5}{10}$$
$$\frac{12}{10} = 1\frac{1}{5}$$

Since you cannot add halves and tenths, you must change the one half to tenths. $10 \div 2 = 5$, so you multiply both terms of $\frac{1}{2}$ by 5. $\frac{1}{2} = \frac{5 \times 1}{5 \times 2} = ?$

Then add $\frac{7}{10}$ and $\frac{5}{10}$. $\frac{7}{10} + \frac{5}{10} = \frac{12}{10} = ?$

5. To change $\frac{3}{4}$ to sixteenths, by what number do you multiply both terms of $\frac{3}{4}$? $\frac{3}{4} = \frac{?}{16}$

6. Find the missing numerators:

$\frac{2}{3} = \frac{?}{6}$ $\quad \frac{1}{4} = \frac{?}{12}$ $\quad \frac{4}{5} = \frac{?}{10}$ $\quad \frac{2}{3} = \frac{?}{12}$ $\quad \frac{3}{8} = \frac{?}{16}$

Change the fractions below to similar fractions and add them. In each example, the larger denominator is the common denominator.

	a	*b*	*c*	*d*	e	*f*
7.	$\frac{3}{8}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{8}$	$\frac{3}{10}$ $\frac{1}{2}$	$\frac{1}{10}$ $\frac{2}{5}$	$\frac{1}{12}$ $\frac{1}{2}$	$\frac{1}{4}$ $\frac{5}{12}$
8.	$\frac{1}{2}$ $\frac{7}{8}$	$\frac{5}{6}$ $\frac{1}{3}$	$\frac{4}{5}$ $\frac{3}{10}$	$\frac{8}{9}$ $\frac{1}{3}$	$\frac{1}{12}$ $\frac{2}{3}$	$\frac{2}{3}$ $\frac{5}{6}$
9.	$\frac{7}{12}$ $\frac{2}{3}$	$\frac{3}{16}$ $\frac{1}{2}$	$\frac{3}{4}$ $\frac{7}{16}$	$\frac{3}{4}$ $\frac{11}{12}$	$\frac{2}{3}$ $\frac{5}{9}$	$\frac{1}{2}$ $\frac{9}{16}$

Are all your answers in lowest terms?

Adding Mixed Numbers

$$\begin{array}{r} 1\frac{1}{2} = 1\frac{3}{6} \\ 1\frac{2}{3} = 1\frac{4}{6} \\ 2\frac{1}{6} = 2\frac{1}{6} \\ \hline 4\frac{8}{6} = 5\frac{1}{3} \end{array}$$

1. Tom keeps a record of how long he works each day on his paper route. He worked $1\frac{1}{2}$ hours on Thursday, $1\frac{2}{3}$ hours on Friday, and $2\frac{1}{6}$ hours on Saturday. To find how many hours his paper route took on these days, add $1\frac{1}{2}$, $1\frac{2}{3}$, and $2\frac{1}{6}$.

The common denominator of the three fractions is the largest denominator, 6. So you change $\frac{1}{2}$ and $\frac{2}{3}$ to sixths, then add. Change the $\frac{8}{6}$ in the sum to a mixed number in lowest terms ($1\frac{1}{3}$), and add it to 4. How long did Tom work?

Copy and add these mixed numbers.

	a	b	c	d	e	f
2.	$1\frac{1}{2}$ $2\frac{1}{8}$	$1\frac{5}{6}$ $\frac{1}{2}$	$3\frac{3}{4}$ $2\frac{5}{8}$	$2\frac{2}{3}$ $1\frac{1}{6}$	$2\frac{7}{10}$ $5\frac{4}{5}$	$3\frac{1}{2}$ $3\frac{5}{8}$
3.	$4\frac{2}{3}$ $3\frac{5}{9}$	$6\frac{9}{10}$ $3\frac{1}{2}$	$7\frac{7}{12}$ $3\frac{2}{3}$	$8\frac{3}{4}$ $4\frac{11}{16}$	$6\frac{3}{4}$ $7\frac{5}{12}$	$5\frac{1}{2}$ $6\frac{7}{16}$
4.	$2\frac{3}{4}$ $1\frac{1}{2}$ $3\frac{3}{4}$	$1\frac{7}{8}$ $\frac{1}{2}$ $1\frac{3}{4}$	$3\frac{3}{10}$ $4\frac{2}{5}$ $2\frac{1}{2}$	$2\frac{1}{3}$ $3\frac{5}{6}$ $4\frac{1}{2}$	$2\frac{1}{2}$ $5\frac{5}{8}$ $7\frac{3}{16}$	$1\frac{3}{4}$ $5\frac{2}{3}$ $6\frac{5}{12}$

Changing Fractions To Subtract

1. Sue wants to make some cookies. The recipe she is using calls for $\frac{3}{4}$ cup of sugar. She has only $\frac{1}{2}$ cup of sugar. To find how much more sugar Sue needs, subtract $\frac{1}{2}$ from $\frac{3}{4}$. You change $\frac{1}{2}$ to fourths before you subtract. What part of a cup of sugar does Sue need?

$$\begin{array}{r} \frac{3}{4} = \frac{3}{4} \\ \frac{1}{2} = \frac{2}{4} \\ \hline \frac{1}{4} \end{array}$$

2. In Jean's city, 8 blocks make a mile, so each block is $\frac{1}{8}$ mile long. Jean lives 7 blocks ($\frac{7}{8}$ mile) from the public library and 4 blocks ($\frac{1}{2}$ mile) from her school. Find how much farther Jean lives from the library than from the school.

Copy and subtract.

	a	*b*	*c*	*d*	*e*	*f*
3.	$\frac{1}{2}$ $\frac{3}{8}$	$\frac{5}{8}$ $\frac{1}{4}$	$\frac{3}{4}$ $\frac{1}{8}$	$\frac{5}{6}$ $\frac{1}{2}$	$\frac{5}{6}$ $\frac{2}{3}$	$\frac{9}{10}$ $\frac{1}{2}$
4.	$\frac{2}{3}$ $\frac{1}{9}$	$\frac{4}{5}$ $\frac{3}{10}$	$\frac{8}{9}$ $\frac{1}{3}$	$\frac{1}{2}$ $\frac{1}{10}$	$\frac{7}{8}$ $\frac{1}{4}$	$\frac{7}{10}$ $\frac{1}{5}$
5.	$\frac{11}{12}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{12}$	$\frac{2}{3}$ $\frac{1}{12}$	$\frac{15}{16}$ $\frac{1}{2}$	$\frac{7}{12}$ $\frac{1}{3}$	$\frac{3}{4}$ $\frac{3}{16}$

Subtracting With Mixed Numbers

$$\begin{array}{r} 4\frac{7}{8} = 4\frac{7}{8} \\ \frac{3}{4} = \frac{6}{8} \\ \hline 4\frac{1}{8} \end{array}$$

1. Sally had $4\frac{7}{8}$ yards of Christmas ribbon. She used $\frac{3}{4}$ yard to tie up a present. To find how much ribbon she had left, subtract $\frac{3}{4}$ from $4\frac{7}{8}$.

First make the fractions similar fractions by changing $\frac{3}{4}$ to eighths, before you subtract. How many yards of ribbon did Sally have left?

Copy and subtract. Be sure all your answers are in lowest terms.

	a	*b*	*c*	*d*	*e*	*f*
2.	$3\frac{1}{2}$ $1\frac{1}{4}$	$5\frac{1}{2}$ $2\frac{1}{8}$	$7\frac{9}{10}$ $3\frac{1}{2}$	$6\frac{3}{4}$ $1\frac{3}{8}$	$5\frac{5}{6}$ $1\frac{1}{2}$	$8\frac{8}{9}$ $3\frac{2}{3}$
3.	$2\frac{11}{12}$ $\frac{2}{3}$	$1\frac{4}{5}$ $\frac{3}{10}$	$4\frac{2}{3}$ $4\frac{1}{6}$	$9\frac{13}{16}$ $3\frac{1}{2}$	$8\frac{3}{4}$ $5\frac{5}{12}$	$7\frac{3}{4}$ $4\frac{3}{16}$
4.	$10\frac{1}{2}$ $3\frac{5}{12}$	$15\frac{7}{9}$ $9\frac{1}{3}$	$13\frac{2}{3}$ $4\frac{7}{12}$	$22\frac{3}{5}$ $8\frac{1}{10}$	$24\frac{11}{12}$ $15\frac{2}{3}$	$30\frac{15}{16}$ $23\frac{5}{8}$

Borrowing To Subtract

1. Bob has orders for $4\frac{1}{2}$ dozen eggs. He has only $2\frac{5}{6}$ dozen on hand. To find how many dozen eggs he still needs, you must subtract $2\frac{5}{6}$ from $4\frac{1}{2}$.

$$4\tfrac{1}{2} = 4\tfrac{3}{6} = 3\tfrac{9}{6}$$
$$2\tfrac{5}{6} = 2\tfrac{5}{6} = 2\tfrac{5}{6}$$
$$1\tfrac{4}{6}$$
$$= 1\tfrac{2}{3}$$

In this problem, you must first change the $\frac{1}{2}$ to sixths. Then, since you cannot subtract $\frac{5}{6}$ from $\frac{3}{6}$, you must borrow. Finish explaining how the example is worked. How many dozen eggs does Bob need?

You can check subtraction of fractions just as you check subtraction of whole numbers—by addition. To check this example, go back over your work. Follow the arrow. Add $1\frac{2}{3}$ to $2\frac{5}{6}$: $1\frac{4}{6} + 2\frac{5}{6} = 3\frac{9}{6}$. $3\frac{9}{6} = 4\frac{3}{6} = 4\frac{1}{2}$.

Copy, subtract, and check. Remember, your answers should be in lowest terms.

	a	b	c	d	e	f
2.	$5\frac{1}{2}$ $2\frac{3}{4}$	$6\frac{1}{8}$ $3\frac{1}{2}$	$2\frac{2}{5}$ $\frac{7}{10}$	$3\frac{2}{3}$ $2\frac{5}{6}$	$4\frac{3}{8}$ $3\frac{7}{8}$	$9\frac{1}{4}$ $4\frac{5}{8}$
3.	5 $1\frac{3}{5}$	$1\frac{1}{3}$ $\frac{7}{12}$	3 $\frac{5}{12}$	2 $\frac{3}{8}$	7 $3\frac{1}{16}$	3 $1\frac{4}{7}$
4.	$8\frac{1}{2}$ $3\frac{9}{10}$	$6\frac{1}{3}$ $5\frac{4}{9}$	2 $\frac{9}{10}$	$9\frac{7}{12}$ $7\frac{2}{3}$	$3\frac{2}{5}$ $2\frac{9}{10}$	$8\frac{1}{6}$ $4\frac{1}{3}$
5.	$10\frac{1}{2}$ $6\frac{11}{12}$	$12\frac{7}{16}$ $9\frac{3}{4}$	15 $6\frac{7}{10}$	$14\frac{5}{12}$ $4\frac{1}{2}$	$12\frac{3}{16}$ $7\frac{3}{4}$	$15\frac{2}{3}$ $7\frac{11}{12}$
6.	$13\frac{5}{8}$ $8\frac{15}{16}$	$10\frac{3}{10}$ $2\frac{4}{5}$	$16\frac{1}{4}$ $5\frac{7}{12}$	$18\frac{1}{2}$ $4\frac{13}{16}$	$20\frac{1}{8}$ $19\frac{3}{16}$	$60\frac{2}{3}$ $53\frac{8}{9}$

Using Fractions

See how well you can use fractions in problems. You may be able to solve some of these problems as quickies.

1. Jean bought $2\frac{1}{2}$ yards of ribbon. She used $\frac{7}{8}$ yard to make a hair ribbon. How many yards did she have left?

2. Bob sold $1\frac{1}{2}$ dozen eggs to one customer and $\frac{3}{4}$ dozen to another customer. How many dozen eggs did he sell?

3. Sam and his father are driving to the city, 36 miles from their home. They have gone 27 miles. What part of the distance have they gone? What part do they still have to drive?

4. Sue used $1\frac{3}{4}$ cups of sugar to make candy and $\frac{7}{8}$ cup to make cookies. How many cups of sugar did she use for both the candy and the cookies?

5. This year, Sam caught a trout $12\frac{3}{8}$ inches long. The largest trout he caught last year was only $10\frac{3}{4}$ inches long. How much longer is this year's trout than last year's?

6. Nancy wants to practice her piano lesson 4 hours this week. She has practiced $2\frac{2}{3}$ hours already. How many more hours must she practice?

7. Sue's mother pays her 40 cents an hour for helping with the housework. Saturday morning, Sue worked 45 minutes. What part of an hour did she work? How much money did Sue earn?

8. Nora got a new book from the library. She read $1\frac{1}{2}$ hours Saturday morning and $2\frac{5}{6}$ hours Saturday evening. How long did she read on Saturday?

9. Bob got $13\frac{5}{12}$ doz. eggs from his hens one week. He gave $1\frac{3}{4}$ doz. to his mother and sold the rest. How many dozen eggs did he sell?

10. By the road, it is $2\frac{3}{10}$ miles from Sam's house to the lake. By a short cut through the woods, it is only $1\frac{1}{2}$ miles. How much shorter is it through the woods than by the road?

11. Don worked for his father $12\frac{1}{2}$ hours one week, $9\frac{3}{4}$ hours the next week, and $10\frac{3}{4}$ hours the third week. How many hours did he work for his father in all three weeks?

12. Bob lives $8\frac{1}{2}$ miles from town. Jill lives $6\frac{7}{10}$ miles from town. How many miles nearer town does Jill live than Bob?

13. In Ann's class there are 16 boys and 8 girls.

a. What fraction of the class are boys?

b. What fraction of the class are girls?

c. The number of girls is what fraction of the number of boys?

d. The number of boys is how many times the number of girls?

14. Sally bought $1\frac{1}{4}$ yards of felt to make a school banner. After making the banner, she had $\frac{3}{8}$ yd. left. How much felt had she used?

15. Barbara is $58\frac{3}{4}$ inches tall. Her mother says she is $7\frac{1}{2}$ inches taller than Barbara. How tall is her mother?

16. If cheese costs 80 cents a pound, how much should I pay for a piece of cheese weighing 8 ounces?

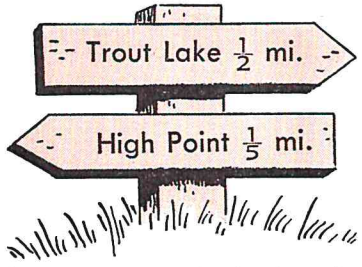
17. Early this morning, the temperature was $49\frac{1}{2}°$. Now it is 66°. How many degrees warmer is it now?

18. Jill sold $1\frac{3}{4}$ dozen tulips from her garden, and $2\frac{11}{12}$ dozen daffodils. How many dozen flowers did Jill sell in all? Can you find how many flowers she sold?

Are all your answers reasonable?

Page 275 provides enrichment material which can be used after this page.

Finding a New Denominator



1. When Bill and Tony were hiking in the State Forest, they came to a sign which said that Trout Lake was $\frac{1}{2}$ mile away in one direction and High Point was $\frac{1}{5}$ mile in the opposite direction. To find what fraction of a mile Trout Lake was from High Point, you must add $\frac{1}{2}$ and $\frac{1}{5}$.

one whole									
$\frac{1}{2}$					$\frac{1}{2}$				
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$	

The larger denominator is 5, but you cannot change $\frac{1}{2}$ to fifths. From the diagram at the left, you can see that you can change both $\frac{1}{2}$ and $\frac{1}{5}$ to tenths. $\frac{1}{2} = \frac{5}{10}$ and $\frac{1}{5} = \frac{2}{10}$. So $\frac{1}{2} + \frac{1}{5} = \frac{5}{10} + \frac{2}{10} = ?$ How far was Trout Lake from High Point?

one whole					
$\frac{1}{2}$			$\frac{1}{2}$		
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{3}$		$\frac{1}{3}$		$\frac{1}{3}$	

2. Sue used $\frac{1}{3}$ cup of walnuts and $\frac{1}{2}$ cup of peanuts in making fudge. To find what part of a cup of nuts she used, you must add $\frac{1}{3}$ and $\frac{1}{2}$.

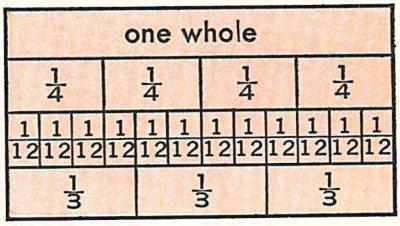
Here, again, both denominators must be changed before you can add the fractions. The diagram shows that both $\frac{1}{3}$ and $\frac{1}{2}$ can be changed to sixths. $\frac{1}{3} + \frac{1}{2} = \frac{2}{6} + \frac{3}{6} = ?$

When you changed $\frac{1}{2}$ to $\frac{5}{10}$ and $\frac{1}{5}$ to $\frac{2}{10}$, you changed them to similar fractions with a **common denominator**, 10. What is the common denominator of $\frac{1}{3}$ and $\frac{1}{2}$?

3. When you cannot use either of the denominators as a common denominator in adding or subtracting fractions, you must find a new denominator. One way to do this is to multiply the denominators.

So, if you want to add $\frac{1}{4}$ and $\frac{2}{3}$, the new denominator will be 4×3, or 12. The diagram at the right shows that $\frac{1}{4} = \frac{3}{12}$ and $\frac{2}{3} = \frac{8}{12}$.

$\frac{1}{4} + \frac{2}{3} = \frac{3}{12} + \frac{8}{12} = \frac{?}{12}$



In finding a common denominator, it is easier to use the smallest denominator that can be divided exactly by both denominators. This is called the lowest, or least, common denominator, or the L.C.D.

A useful way to find the L.C.D. is to multiply the larger of the two denominators by 2, by 3, by 4, and so on, until you find a number into which both denominators will divide exactly.

4. Bob sold $\frac{3}{4}$ dozen eggs to one neighbor and $\frac{5}{6}$ dozen eggs to another. To find how many dozen eggs Bob sold, add $\frac{3}{4}$ and $\frac{5}{6}$.

Multiply 6, the larger denominator, by 2. Will 4, the other denominator, divide 12 exactly? Then 12 is the L.C.D. $\frac{3}{4} + \frac{5}{6} = \frac{9}{12} + \frac{10}{12} = \frac{19}{12} = 1\frac{?}{12}$

5. What is the L.C.D. of the fractions $\frac{3}{8}$ and $\frac{7}{10}$?

Multiply 10, the larger denominator by 2; 20 cannot be divided exactly by 8, the other denominator. Now try 3×10; 8 will not go exactly into 30, either. Multiply 10 by 4. The product, 40, is the first product that can be divided exactly by 8 as well as by 10. It is the L.C.D.

6. What is the L.C.D. of the denominators 4 and 10? 10 and 6? 6 and 8? 8 and 12?

Adding With a New Denominator

1. Don works for his father in his father's apple orchard. He told his father he had worked $1\frac{1}{10}$ hours after school on Monday, $1\frac{1}{5}$ hours on Tuesday, and $1\frac{1}{6}$ hours on Wednesday. To find how many hours Don had worked, what do you do?

$$1\tfrac{1}{10} = 1\tfrac{3}{30}$$
$$1\tfrac{1}{5} = 1\tfrac{6}{30}$$
$$1\tfrac{1}{6} = 1\tfrac{5}{30}$$
$$3\tfrac{14}{30} = 3\tfrac{7}{15}$$

In finding the new denominator, you need to think only of 10 and 6, since 5 will go into any number 10 goes into. Try 2×10. But 6 cannot be divided exactly into 20. Try 3×10. Thirty can be divided by all three denominators. It is the L.C.D.

Explain the work in the box. How long did Don work?

2. Add $\frac{2}{3}$ and $\frac{3}{4}$. What denominator should you use?

3. Add $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{5}{6}$. What denominator do you use?

Copy and add these fractions.

	a	b	c	d
4.	$\frac{1}{2} + \frac{2}{5} = ?$	$\frac{1}{5} + \frac{1}{3} = ?$	$\frac{3}{5} + \frac{1}{2} = ?$	$\frac{1}{3} + \frac{3}{4} = ?$
5.	$\frac{1}{2} + \frac{2}{3} = ?$	$\frac{1}{8} + \frac{1}{3} = ?$	$\frac{1}{4} + \frac{2}{5} = ?$	$\frac{1}{2} + \frac{2}{9} = ?$
6.	$\frac{3}{4} + \frac{1}{10} = ?$	$\frac{2}{3} + \frac{2}{5} = ?$	$\frac{7}{10} + \frac{1}{4} = ?$	$\frac{1}{6} + \frac{1}{4} = ?$
7.	$\frac{5}{8} + \frac{2}{3} = ?$	$\frac{1}{6} + \frac{3}{10} = ?$	$\frac{5}{8} + \frac{5}{6} = ?$	$\frac{3}{8} + \frac{5}{12} = ?$

Copy and add these mixed numbers.

	a	b	c	d	e	f
8.	$3\frac{1}{2}$ $1\frac{1}{3}$	$1\frac{1}{2}$ $2\frac{2}{5}$	$2\frac{3}{4}$ $5\frac{1}{2}$	$4\frac{1}{6}$ $2\frac{9}{10}$	$6\frac{2}{3}$ $3\frac{1}{4}$	$5\frac{3}{4}$ $3\frac{1}{3}$
9.	$6\frac{1}{6}$ $4\frac{3}{8}$	$3\frac{1}{2}$ $4\frac{5}{9}$	$5\frac{4}{5}$ $5\frac{2}{3}$	$2\frac{2}{3}$ $3\frac{5}{8}$	$8\frac{3}{4}$ $5\frac{3}{10}$	$7\frac{5}{6}$ $6\frac{1}{4}$
10.	$2\frac{2}{3}$ $7\frac{3}{4}$	$3\frac{7}{10}$ $18\frac{5}{6}$	$2\frac{7}{8}$ $6\frac{5}{12}$	$8\frac{3}{4}$ $3\frac{2}{5}$	$10\frac{1}{6}$ $4\frac{3}{4}$	$4\frac{1}{8}$ $7\frac{3}{10}$
11.	$2\frac{2}{3}$ $1\frac{1}{2}$ $2\frac{1}{3}$	$1\frac{3}{4}$ $4\frac{1}{2}$ $\frac{2}{3}$	$2\frac{1}{2}$ $4\frac{4}{5}$ $3\frac{3}{5}$	$3\frac{5}{6}$ $1\frac{1}{2}$ $2\frac{1}{4}$	$3\frac{1}{8}$ $2\frac{3}{10}$ $3\frac{1}{2}$	$5\frac{1}{6}$ $2\frac{2}{5}$ $2\frac{3}{10}$

Are all your answers in lowest terms?

Can You Count With Fractions?

See if you can count with fractions. Copy, and fill in the numbers that have been left out.

1. $\frac{1}{3}$, $\frac{2}{3}$, 1, ?, $1\frac{2}{3}$, 2, $2\frac{1}{3}$, ?, ?, $3\frac{1}{3}$, ?, 4
2. $\frac{1}{4}$, $\frac{1}{2}$, ?, 1, ?, $1\frac{1}{2}$, $1\frac{3}{4}$, ?, $2\frac{1}{4}$, ?, ?, 3
3. $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, ?, $\frac{5}{8}$, ?, ?, 1, $1\frac{1}{8}$, ?, ?, $1\frac{1}{2}$, ?, $1\frac{3}{4}$, ?, 2
4. $\frac{1}{6}$, $\frac{1}{3}$, $\frac{1}{2}$, ?, $\frac{5}{6}$, ?, $1\frac{1}{6}$, ?, ?, $1\frac{2}{3}$, ?, 2

Changing Denominators to Subtract

$$8\tfrac{1}{4} = 8\tfrac{5}{20} = 7\tfrac{25}{20}$$
$$3\tfrac{4}{5} = 3\tfrac{16}{20} = 3\tfrac{16}{20}$$
$$4\tfrac{9}{20}$$

1. Sam rode his bicycle $3\frac{4}{5}$ miles when he went to school, and $8\frac{1}{4}$ miles when he went to the lake. To find how many miles farther he rode when he went to the lake, what must you do?

The least common denominator for the denominators 4 and 5 is 20. Change $\frac{1}{4}$ to $\frac{5}{20}$ and $\frac{4}{5}$ to $\frac{16}{20}$. You cannot subtract $\frac{16}{20}$ from $\frac{5}{20}$, so you borrow 1 ($\frac{20}{20}$) from 8, and change $8\frac{5}{20}$ to $7\frac{25}{20}$. Now you can subtract $3\frac{16}{20}$ from $7\frac{25}{20}$. How many miles farther did Sam ride when he went to the lake?

Check by following the arrow back over the work. $4\frac{9}{20} + 3\frac{16}{20} = 7\frac{25}{20} = 8\frac{5}{20} = 8\frac{1}{4}$.

2. What common denominator do you use when you subtract halves and thirds? Thirds and fourths? Fourths and sixths?

Copy and subtract these fractions.

	a	b	c	d
3.	$\frac{2}{3} - \frac{1}{2} = ?$	$\frac{3}{4} - \frac{1}{3} = ?$	$\frac{2}{3} - \frac{1}{4} = ?$	$\frac{3}{4} - \frac{1}{6} = ?$
4.	$\frac{3}{5} - \frac{1}{4} = ?$	$\frac{4}{5} - \frac{1}{3} = ?$	$\frac{1}{2} - \frac{1}{5} = ?$	$\frac{4}{5} - \frac{1}{2} = ?$
5.	$\frac{2}{3} - \frac{1}{8} = ?$	$\frac{9}{10} - \frac{3}{4} = ?$	$\frac{7}{8} - \frac{1}{3} = ?$	$\frac{3}{4} - \frac{2}{5} = ?$
6.	$\frac{5}{6} - \frac{1}{10} = ?$	$\frac{1}{2} - \frac{2}{9} = ?$	$\frac{5}{6} - \frac{3}{8} = ?$	$\frac{5}{8} - \frac{5}{12} = ?$

Copy, subtract, and check.

	a	b	c	d	e	f
7.	$3\frac{3}{4}$ $1\frac{1}{3}$	$7\frac{3}{5}$ $2\frac{1}{2}$	$5\frac{1}{2}$ $3\frac{1}{5}$	$5\frac{1}{2}$ $1\frac{2}{3}$	$2\frac{1}{3}$ $\frac{3}{4}$	$6\frac{1}{5}$ $5\frac{3}{4}$
8.	$7\frac{4}{5}$ $3\frac{1}{3}$	$5\frac{3}{10}$ $4\frac{1}{4}$	$6\frac{1}{6}$ $2\frac{3}{4}$	$9\frac{1}{2}$ $4\frac{7}{9}$	$8\frac{2}{3}$ $7\frac{7}{8}$	$6\frac{1}{4}$ $1\frac{2}{3}$
9.	$11\frac{2}{3}$ $4\frac{3}{4}$	$9\frac{5}{8}$ $2\frac{3}{10}$	$12\frac{1}{6}$ $9\frac{7}{10}$	$10\frac{1}{4}$ $5\frac{2}{5}$	$13\frac{1}{6}$ $8\frac{3}{8}$	$15\frac{7}{8}$ $6\frac{5}{12}$

Are all your answers in lowest terms?

Can You Find the Missing Numerators?

In each of these examples, a numerator has been left out. Copy the examples and fill in the missing numerators.

	a	b	c
1.	$1 = \frac{?}{6}$	$1 = \frac{?}{12}$	$1\frac{3}{8} = \frac{?}{8}$
2.	$4\frac{1}{5} = 3\frac{?}{5}$	$7\frac{5}{12} = 6\frac{?}{12}$	$10\frac{4}{9} = 9\frac{?}{9}$
3.	$\frac{3}{4} = \frac{?}{8}$	$\frac{2}{3} = \frac{?}{12}$	$\frac{1}{2} = \frac{?}{16}$
4.	$\frac{6}{9} = \frac{?}{3}$	$\frac{27}{36} = \frac{?}{4}$	$\frac{10}{16} = \frac{?}{8}$
5.	$\frac{14}{8} = 1\frac{?}{4}$	$\frac{28}{10} = 2\frac{?}{5}$	$\frac{20}{6} = 3\frac{?}{3}$
6.	$\frac{1}{2} + \frac{1}{6} = \frac{?}{3}$	$\frac{2}{5} + \frac{3}{10} = \frac{?}{10}$	$\frac{1}{4} + \frac{1}{3} = \frac{?}{12}$
7.	$1 - \frac{9}{16} = \frac{?}{16}$	$\frac{5}{6} - \frac{1}{4} = \frac{?}{12}$	$1\frac{1}{5} - \frac{1}{2} = \frac{?}{10}$

Practice in Adding Fractions

These examples will show you how much you have learned about adding fractions. Be sure all the fractions in the sums are in lowest terms.

Can you add similar fractions?

	a	b	c	d	e	f
1.	$\frac{1}{8}$ $\frac{5}{8}$	$\frac{2}{3}$ $\frac{2}{3}$	$\frac{5}{6}$ $\frac{5}{6}$	$\frac{5}{9}$ $\frac{7}{9}$	$\frac{7}{10}$ $\frac{9}{10}$	$\frac{11}{12}$ $\frac{7}{12}$
2.	$3\frac{5}{9}$ $2\frac{2}{9}$	$4\frac{5}{8}$ $3\frac{3}{8}$	$1\frac{4}{5}$ $4\frac{3}{5}$	$3\frac{9}{16}$ $5\frac{11}{16}$	$6\frac{1}{6}$ $3\frac{5}{6}$	$2\frac{5}{12}$ $8\frac{11}{12}$

Can you add fractions with the new denominator shown?

3.	$\frac{5}{12}$ $\frac{1}{2}$	$\frac{1}{5}$ $\frac{7}{10}$	$\frac{3}{4}$ $\frac{5}{8}$	$\frac{7}{16}$ $\frac{7}{8}$	$\frac{2}{3}$ $\frac{7}{12}$	$\frac{5}{9}$ $\frac{2}{3}$
4.	$1\frac{1}{4}$ $2\frac{5}{8}$	$3\frac{2}{3}$ $6\frac{5}{6}$	$3\frac{9}{10}$ $4\frac{1}{2}$	$6\frac{1}{3}$ $2\frac{4}{9}$	$8\frac{11}{12}$ $3\frac{3}{4}$	$7\frac{13}{16}$ $5\frac{3}{4}$

Can you find the L. C. D. in adding fractions?

5.	$\frac{1}{3}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{2}{3}$	$\frac{4}{5}$ $\frac{1}{2}$	$\frac{3}{4}$ $\frac{3}{5}$	$\frac{3}{4}$ $\frac{5}{6}$	$\frac{5}{8}$ $\frac{5}{12}$
6.	$2\frac{1}{2}$ $2\frac{2}{9}$	$2\frac{3}{5}$ $5\frac{1}{2}$	$4\frac{1}{3}$ $1\frac{3}{4}$	$3\frac{1}{6}$ $6\frac{7}{10}$	$4\frac{2}{3}$ $5\frac{5}{8}$	$5\frac{7}{8}$ $9\frac{5}{6}$

Can you add three fractions?

7.	$\frac{3}{4}$ $\frac{1}{2}$ $\frac{7}{12}$	$\frac{3}{16}$ $\frac{7}{8}$ $\frac{3}{4}$	$\frac{3}{4}$ $\frac{2}{5}$ $\frac{7}{10}$	$3\frac{1}{2}$ $2\frac{1}{4}$ $1\frac{2}{3}$	$2\frac{5}{6}$ $4\frac{1}{2}$ $5\frac{2}{3}$	$7\frac{7}{8}$ $4\frac{3}{10}$ $6\frac{1}{4}$

Practice in Subtracting Fractions

Work these examples to see how much you know about subtracting fractions. Make sure all the fractions in your answers are in lowest terms. Check by going back over your work.

Can you subtract fractions from whole numbers?

	a	b	c	d	e	f
1.	$1 - \frac{5}{8}$	$3 - \frac{1}{6}$	$2 - \frac{3}{5}$	$2 - \frac{7}{12}$	$4 - \frac{7}{9}$	$1 - \frac{3}{10}$

Can you subtract mixed numbers from whole numbers?

2.	$4 - 1\frac{5}{12}$	$7 - 5\frac{5}{6}$	$16 - 8\frac{1}{2}$	$5 - 2\frac{3}{8}$	$10 - 9\frac{1}{4}$	$8 - 3\frac{1}{3}$

Can you subtract similar fractions?

3.	$\frac{4}{5} - \frac{1}{5}$	$\frac{7}{8} - \frac{1}{8}$	$\frac{11}{12} - \frac{5}{12}$	$7\frac{5}{6} - 4\frac{5}{6}$	$2\frac{1}{10} - \frac{7}{10}$	$10\frac{1}{4} - 9\frac{3}{4}$

Can you subtract fractions with the new denominator shown?

4.	$\frac{9}{10} - \frac{1}{2}$	$\frac{2}{3} - \frac{5}{12}$	$\frac{3}{4} - \frac{1}{8}$	$\frac{4}{5} - \frac{1}{10}$	$\frac{8}{9} - \frac{2}{3}$	$\frac{5}{6} - \frac{1}{3}$
5.	$3\frac{1}{2} - 2\frac{1}{6}$	$4\frac{7}{8} - 1\frac{3}{4}$	$6\frac{1}{2} - 4\frac{11}{12}$	$3\frac{3}{10} - 2\frac{4}{5}$	$8\frac{7}{16} - 5\frac{3}{4}$	$10\frac{1}{2} - 7\frac{9}{10}$

Can you find the L. C. D. in subtracting fractions?

6.	$\frac{1}{2} - \frac{1}{3}$	$\frac{2}{3} - \frac{1}{4}$	$\frac{9}{10} - \frac{3}{4}$	$\frac{4}{5} - \frac{1}{2}$	$\frac{5}{6} - \frac{1}{4}$	$\frac{11}{12} - \frac{7}{8}$
7.	$5\frac{7}{8} - 1\frac{1}{3}$	$4\frac{1}{3} - 3\frac{3}{4}$	$7\frac{5}{6} - 5\frac{3}{10}$	$10\frac{3}{5} - 5\frac{3}{4}$	$7\frac{1}{4} - 4\frac{7}{10}$	$9\frac{1}{8} - 3\frac{5}{6}$

Pages 276 and 277 provide enrichment material which can be used after this page.

Fraction Quickies

Try these quickies to see how much you know about using fractions. Just tell or write the answers.

1. Tom plans to spend $\frac{3}{4}$ of the money he earns and save the rest. What part of his money is Tom going to save?

2. Nancy practiced her piano lesson $\frac{1}{4}$ hour in the morning and $\frac{1}{2}$ hour in the afternoon. How much did she practice all day?

3. Sue opened a two-pound sack of sugar. She used $1\frac{1}{2}$ pounds to make some candy. How much sugar was left?

4. Sue is baking a cake. It takes $\frac{3}{4}$ hour for the cake to bake, and it has been in the oven for $\frac{1}{2}$ hour. How much longer must it stay in the oven?

5. We used $\frac{3}{4}$ of a loaf of bread for lunch and $1\frac{1}{4}$ loaves for dinner. How many loaves did we use for both meals?

6. Bob has an order for 1 dozen eggs. He has only $\frac{2}{3}$ of a dozen. What part of a dozen eggs does he need?

7. One week, Bob collected $5\frac{1}{3}$ dozen eggs. He sold all but $\frac{2}{3}$ dozen. How many dozen did he sell?

8. Sally needs $3\frac{3}{8}$ yards of material to make a dress and $1\frac{1}{4}$ yards of the same material to make an apron. How many yards does she need in all?

9. Ann cut a pie into 6 equal pieces. She and Jean each ate 1 piece. What fraction of the pie was left?

10. Don worked for his father $7\frac{1}{2}$ hr. last week and 9 hr. this week. How many hours more did he work this week than last?

11. Judy's favorite television show lasts 15 minutes. What part of an hour does the show last?

Working With Zeros

1. Read 20,418. How would you read this number if the zero were left out?

2. In the number 46,307, the zero means that there are no tens in the number. What does the zero mean in the number, 8,065? Read this number.

3. Read 7,009. Tell what each zero in this number means.

4. Read $30.75. How would you read this number without the zero?

Read these numbers:

	a	*b*	*c*	*d*
5.	7,050	20,406	508,021	9,000,370
6.	$9.07	$20.04	$200.10	$50.00

7. On the blackboard, write twenty million in figures. How many zeroes did you use? How many commas?

8. On your paper, write ten dollars and nine cents in figures, using the dollar sign and decimal point.

9. Write these six numbers in figures in columns, and find the sum: Five hundred six, eight thousand thirty, ten thousand seventy, four thousand five, three hundred ninety, and forty thousand sixty-one.

10. Write these six money numbers in figures in columns, and add them: Three dollars and fifty cents, eighteen dollars, nine dollars and nine cents, forty dollars and six cents, ten dollars and twenty cents, and ninety cents.

11. Subtract ten dollars and sixteen cents from twenty dollars.

12. Divide one hundred seven dollars and ten cents by thirty-five.

13. Multiply nineteen dollars and sixteen cents by thirty.

What Is a Leap Year?

JANUARY						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

FEBRUARY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

MARCH						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

APRIL						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

MAY						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JUNE						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

JULY						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

OCTOBER						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

NOVEMBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

DECEMBER						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

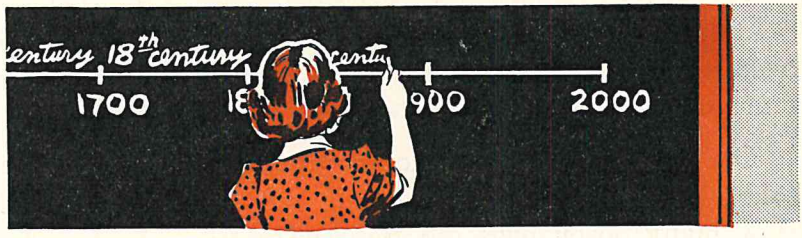
1. Can you find out from this calendar how many days there are in a year? Count the number of full weeks, multiply by 7, and add the number of days not included in the full weeks. How many days are in a year?

You can also find the number of days in a year by adding the number of days in each month.

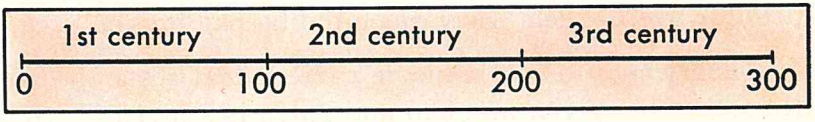
2. A year is really a few hours longer than 365 days, so every 4 years another day is added to February. This fourth year is called a leap year. 1952 was a leap year. Name the next three leap years after 1952.

3. A leap year's number is exactly divisible by 4. Is 1970 a leap year? 1980? 1918? 1948?

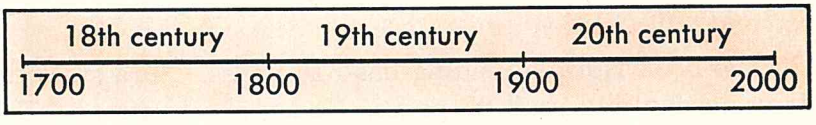
Using a Time Line



Ann's class is studying how time is measured in centuries. She wanted to find out why the year 1953 is in the 20th century instead of the 19th century, so she drew a time line on the blackboard. Her time line started like this:



Ann's time line ended like this:



1. How many years are there in a century? The first century ended with the year 100. The second century started with the year 101 and ended with the year 200. With what year did the 3rd century start? When did it end?

2. When did the 18th century start and end?

3. The Declaration of Independence was signed in 1776. In what century was this?

4. In what century is the year 1492? 1907? 1066? 1660?

5. A church in Tom's city was built in MDCCLX. In what century was it built? How many centuries old is it?

Page 278 provides enrichment material which can be used after this page.

Which Numbers Do You Use?

In each of these problems there is a number you do not need in solving the problem. Decide which numbers you must use, and then solve the problem.

1. One week Bob sold $5\frac{3}{4}$ dozen eggs. The next week he sold $5\frac{1}{2}$ dozen. He got 65 cents a dozen for all the eggs. How many dozen eggs did Bob sell?

2. Mr. Lane bought 9 gallons of gasoline at 26 cents a gallon. He gave the filling station attendant a five-dollar bill. How much did the gasoline cost in all?

3. Dick's father bought a used car for $1185 and 2 new tires for $16.75 each. How much did he pay for the tires?

4. Allen wants to buy a movie camera that costs $59.95. His father has given him $25 and Allen has saved $26.75. How much money does Allen have so far towards buying the camera?

5. The book Nora is reading has 310 pages. Nora started it yesterday and read 97 pages. Today she has read 118 pages more. How many pages has she read?

6. Shirts that regularly sold for $3 were on sale for $2.29. Jim's mother bought him 4 of these shirts. How much did she save on each shirt?

7. Sue and her mother are putting their jars of canned vegetables on 4 shelves in the cellar. They have 45 jars of tomatoes, 28 jars of corn, and 39 jars of string beans. How many jars of vegetables do they have?

8. Mr. Lane must make a 105-mile trip in 3 hours. In the first hour he drove 38 miles. How far does he still have to drive?

9. Bob paid \$4.75 for a gallon can of paint to paint his hen house. This paint would have cost \$1.45 a quart. How much would Bob have paid for the paint if he had bought it by the quart?

10. One day, Don's father sold 12 crates of strawberries. There were 24 boxes of strawberries in each crate. At 35 cents a box, how much did he receive for each crate of strawberries?

11. Jerry had \$3.10. He bought some stamps for \$1.25. Then he earned 75 cents. How much money did he have after buying the stamps?

12. When we started on a trip, the speedometer in our car read 29876 miles. At the end of the trip, the speedometer read 30161 miles. We used 15 gallons of gasoline on the trip. How many miles did we drive?

13. Sally went to the store for her mother. She spent 85 cents for frozen vegetables and 56 cents for milk. She handed the clerk \$2. How much did Sally spend?

14. Jill and her mother have 150 lily bulbs. They want to set out 12 rows of lilies, with 18 lilies in each row. How many bulbs do they want to set out?

15. Corn was selling for 50 cents a dozen ears. Don helped his father pick 180 ears. How many dozen ears of corn did they pick?

16. The weights of 5 baskets of apples that Don sold in 2 days were 48 lb., $49\frac{1}{2}$ lb., 49 lb., $50\frac{3}{4}$ lb., and $51\frac{3}{4}$ lb. How many pounds of apples did Don sell?

17. The boys in Tom's class are putting 190 chairs in rows for a school play. They have already made 13 rows of chairs with 14 chairs in each row. How many chairs have they arranged?

Finding the Hidden Question

1. Ann's mother bought 10 yards of cloth. She used $3\frac{7}{8}$ yards to make a dress for Ann and $5\frac{1}{4}$ yards to make a dress for herself. How much cloth was left?

To solve this problem, you must answer two questions, but only the *second* question is written. The first question is hidden in the problem. Before you can find how much cloth is left, you must think, "How many yards did Ann's mother use for both dresses?"

In each of the following problems, find the hidden question, then work the two steps to answer the written question.

2. In its first game, Bill's basketball team scored 9 points. In its second game, it scored 17 points, and in the third game 25 points. How many points did the team score, on the average, in each of its first three games?

3. Don worked in the orchard $3\frac{1}{4}$ hours yesterday morning and $1\frac{3}{4}$ hours yesterday afternoon. His father paid him 35 cents an hour. How much did Don earn yesterday?

4. Four years ago, Jim weighed 59 lb. Now he weighs 85 lb. On the average, how many pounds a year has he gained in the last 4 years?

5. Bill went camping with 5 other Boy Scouts. They ate 7 meals while they were out camping. The total cost of the food was $12.18. The 6 boys shared the cost equally. On an average, how much did each boy pay for each meal he ate?

6. Ellen's father gives her an allowance of $2.50 a week. Ellen pays for her school lunches out of her allowance. One week, Ellen bought 5 school lunches for 23 cents each. How much of her allowance did she have left for other things that week?

7. Bob sold a 5-pound chicken for 45 cents a pound, and a dozen eggs for 60 cents. How much did he get for the chicken and the eggs?

8. Our automobile went 300 miles on 8 gallons of gasoline. If the gasoline cost 25 cents a gallon, how much per mile did we pay for gasoline to run our car?

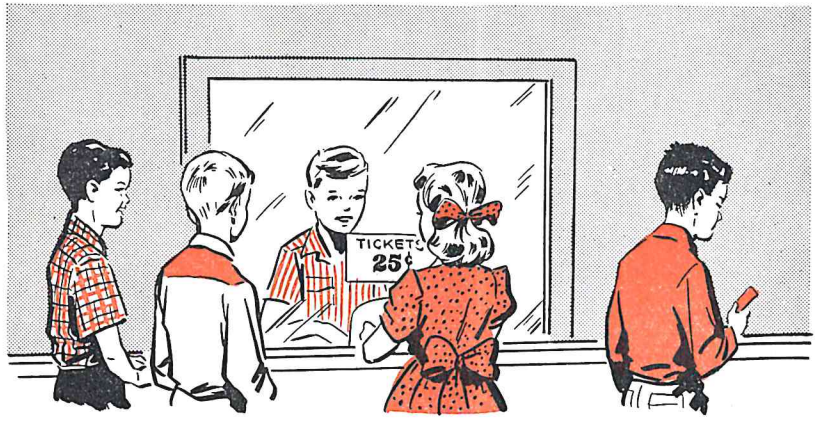
9. In Linda's school there are 3 sixth grade rooms. In one room there are 29 pupils, in another room 26 pupils, and in the third room 32 pupils. What is the average number of pupils per room?

10. From a board 90 inches long Dick wanted to saw off 5 pieces, each 14 inches long. How much of the board would be left?

11. Don picked 30 ears of corn in his garden. He sold it at 6 ears for 25 cents. How much did he get for the 30 ears?

12. Ellen bought $\frac{3}{4}$ pound of candy costing 80 cents a pound. How much change did she get from a dollar?

Which Two Processes?



1. We sold 168 tickets for our school play at 25 cents a ticket. Our expenses for the play were $9.75. How much money did we clear on our play?

In this problem, you *multiply* to find how much was received from the sale of tickets, then *subtract* to find how much was cleared. On your paper, write M, S, and your answer.

For each of the following problems, write the letters showing the two processes you use to solve the problem, then find the answer and write it after the letters.

2. In 3 months our bills for electricity were $5.87, $6.59, and $5.06. How much did we pay for electricity each month on the average?

3. Mr. Lane bought 9 gallons of gasoline at 26 cents a gallon and a quart of oil for 30 cents. How much did he pay in all?

4. Mrs. Gray bought 10 yards of cloth to make 3 dresses for Sue. The cloth cost 78 cents a yard. How much did the material for each dress cost?

5. Nine boys and 8 girls are coming to Ellen's party. Ellen's mother wants to buy a paper-hat snapper for each child at the party. At 15 cents apiece, how much will the snappers cost? (Don't forget Ellen!)

6. In the school cafeteria, Pamela counted 4 rows of tables with 6 tables in each row. Each table will seat 14 pupils. How many children can eat in the cafeteria at one time? (In this problem you use one process twice.)

7. There are 405 pupils in Mary's school. Two hundred nine of them are girls. How many more girls than boys are there in the school?

8. The speedometer on our car read 9876 miles when we started on our trip. It read 10804 miles at the end of the trip. We used 58 gal. of gasoline in all. How many miles per gallon of gasoline did we get?

9. Ken weighs 102 pounds, his little sister Donna weighs 59 pounds, and their father weighs 170 pounds. Their father weighs how many pounds more than Donna and Ken together?

10. Don picked 24 quarts of cherries. His mother kept 8 quarts and told Don he could sell the rest. At 30¢ a quart, how much did Don get for the rest of the cherries?

11. Bob's father can buy a gallon of oil for his truck for $1.25. If he buys this oil by the quart, it costs 35¢ a quart. How much will Mr. Gray save by buying a gallon of oil instead of 4 quarts?

12. It is $3\frac{1}{2}$ miles from Bob's house to the store and $2\frac{4}{5}$ miles farther on to Dick's house. Bob is riding his bike from his house to Dick's house. He has gone $4\frac{1}{10}$ miles. How much farther does he have to go?

Page 279 provides enrichment material which may be used after this page.

Measures in Two-Step Problems

1. It took Sue and her mother 2 hours to prepare 15 packages of asparagus for freezing in their deep-freeze locker. How many minutes did it take per package?

In this two-step problem, you must know the measure fact that 1 hour = 60 minutes in order to find how many minutes it took to prepare the asparagus.

To work each of the following problems, you have to know some measure fact. On your paper, write the measure fact and find the answer for each problem. You may be able to solve some of these problems as quickies.

2. We bought ice cream bars to sell at our school entertainment. We paid the dealer 75 cents a dozen for the bars and sold them for 10 cents each. How much did we make on a dozen bars?

3. Jean added the weights of the people riding in the Lane car and said they weighed 784 lb. in all. How much less than $\frac{1}{2}$ ton did they weigh?

4. Linda helped her mother with the house work for 45 minutes. Her mother said she would pay her 40 cents an hour. How much did Linda earn?

5. Mr. Gray bought a 5-gallon can of oil for his truck. Every time he changes the oil in his truck, he uses 5 quarts of oil from the can. He has changed the oil 3 times. How many quarts of oil are left in the can?

6. The Lanes pay $125 a month rent for their apartment. How much rent have they paid in the two years they have lived there?

7. Don has picked 2 bushels of peas from his garden. If he sells them all for 15 cents a quart, how much will he get?

8. Don calculated that he had worked in his garden an average of 40 minutes a day for 32 days. How many hours had he worked?

9. When ice cream is selling for 80 cents a quart, how much should I pay for a quart and a pint of ice cream at that rate?

10. Jean's committee is making a large time line along the side of the room to show important events in the last 50 years. Each year is to be 2 inches long. How many feet long must the time line be to show 50 years?

11. Tom read that a balloon had once stayed in the air for 87 hours, and that this was longer than 3 days. How many hours longer than 3 days is 87 hours?

12. In the current events period, Nora reported that a party of mountain climbers from three countries had reached the top of a mountain 21,719 ft. high in Peru. She said that this was more than 4 miles above sea level. How many feet higher than 4 miles is this peak?

Completing Two-Step Problems

Make each of these problems a two-step problem by writing a question for it. Then work the problem.

1. Peggy bought 3 tennis balls costing 55 cents apiece. She gave the clerk $2.

2. From a board 12 ft. long, Dick has cut two pieces. One piece is 4 ft. 7 in. long. The other is 3 ft. 6 in. long.

3. At the dime store, drinking glasses are 3 for 25 cents. Sally wants to buy 6 glasses.

4. Four boys in Jerry's club are saving money to buy a book about stamps for $3.45. They have saved $2.65.

5. Jill and her mother took the train to the city. A ticket for Jill's mother was $3.46. Jill rode for half price.

6. In August, baseball bats were reduced from $2.50 apiece to $1.98 apiece. Bill's team bought 3 bats.

7. On a 3-day trip, we drove 385 miles the first day, 409 miles the second day, and 367 miles the third day.

8. Bob sold a chicken for $1.69 and 3 dozen eggs for 65 cents a dozen.

9. Jill has saved $4.75 toward a table radio which is on sale for $18.36. Her parents told her that if she would pay $\frac{1}{3}$ of the cost, they would pay the rest.

10. Sam and Don went fishing. Sam caught two fish, one weighing $\frac{7}{8}$ lb. and the other $1\frac{1}{2}$ lb. Don caught only one fish, but it weighed $3\frac{1}{4}$ lb.

11. Sue's neighbor pays her 50 cents an hour for baby sitting. Sue stayed with the neighbor's baby $1\frac{3}{4}$ hours Friday evening and $3\frac{1}{4}$ hours Saturday evening.

Page 280 provides enrichment material which may be used after this page.

"The Round Up"

The sixth grade in Ann's school wrote their own magazine, "The Round Up." Ann was the editor. The pupils decided to mimeograph and sell their magazine.

1. The magazine was 10 pages long, so they needed 10 stencils for the mimeographing. At 18 cents each, how much did the stencils cost?

2. They decided to make 300 copies of the 10-page magazine. How many sheets of paper did they need if the paper was to be printed only on one side? The paper cost $1.50 per 500 sheets. How much did all the paper cost?

3. They sold "The Round Up" for 5 cents a copy. Karen sold 23 copies. How much money did she take in?

4. Peter took 20 copies to the fourth grade to sell. He sold all but 7 copies. How much money should he have brought back?

5. Lois sold 15 copies of the 20 copies she took out. What fractional part of the 20 copies did she sell? What part was not sold?

6. Tony sold 7 copies and Jerry sold 9 copies. How much money did the two boys take in together?

7. The girls sold 136 copies and the boys sold 157 copies. How much more money did the boys take in than the girls did?

8. Altogether, the pupils sold 293 copies of "The Round Up." How much did they receive for them?

9. From the money received, they paid for the stencils (Problem 1) and the paper (Problem 2). How much money did they have left?

Problems With More than Two Steps

1. Ann is in school from 8:45 a.m. to 12:00 noon, and from 1:15 p.m. to 3:00 p.m. How long is she in school each day?

This problem has three steps. First you must subtract 8 hr. 45 min. from 12 hr. to find how long Ann is in school in the morning. Then you must subtract 1 hr. 15 min. from 3 hr. to find how long she is in school in the afternoon. And, finally, you must add the first two answers to find how long Ann is in school each day.

Each of the following problems has more than two steps. You work the problem as you would work two-step problems, but you use more steps.

2. The 9 boys on a baseball team bought 8 baseballs at $1.89 each and 4 bats at $2.16 each. They shared the cost equally. How much did each boy pay? (How many steps are there in this problem?)

3. Mr. Lane has his car serviced 12 times a year. Each time, he buys 5 quarts of oil at 40 cents a quart, and pays $1.50 for servicing. How much does he pay in a year for oil and servicing?

4. Mrs. Lane sends her sheets and towels to a laundry which charges $1.18 for the first 8 pounds and 11 cents a pound for each pound over 8 pounds. One week, she sent 13 pounds of clothes to the laundry. How much did she have to pay that week?

5. Allen bought a sport shirt for $3.89 and two pairs of socks at 95 cents a pair. How much change did he get from a ten-dollar bill? (Estimate your answer before you work this problem.)

How many of the problems below can you do as quickies?

6. Sally bought 6 oranges which were priced at 60 cents a dozen. She gave the clerk a half dollar. How much change did she get? (This is a quickie.)

7. From 1940 to 1950, the population of our town went from 7,867 to 10,347. Find the average increase per year.

8. At a sale, rayon which had been sold at $1.32 a yard was sold at half price. Ann's mother bought two pieces, one $4\frac{1}{2}$ yards long and one $6\frac{1}{2}$ yards long. How much did she pay for both pieces?

9. Jean bought 5 pounds of sugar at 10 cents a pound and a loaf of bread for 20 cents. How much change should she get from a dollar? (This is another quickie.)

10. When a new 10-cent stamp was issued, 3 boys in Jerry's stamp club each wanted 3 of the stamps and 4 boys wanted 2 stamps each. What was the total cost of these stamps?

11. Last night Jill slept from 9 p.m. to 7 a.m. What part of a day (24 hours) did she spend sleeping?

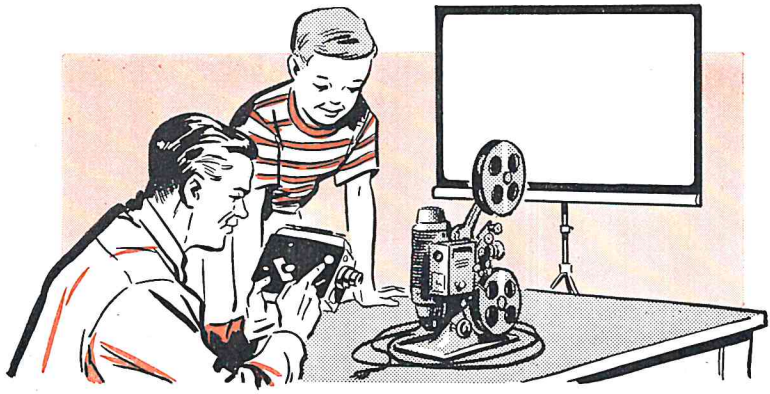
12. Sam weighs 92 pounds and his bicycle weighs 57 pounds. Dick weighs 89 pounds and his bicycle weighs 56 pounds. Sam and his bike are how much heavier than Dick and his bike?

13. Tomato juice is selling at 3 cans for 29 cents. If I buy 9 cans, how much change should I get from a dollar?

14. Ann bought 3 Christmas presents for 50 cents each and 2 presents for 75 cents each. How much did each present cost on the average?

15. The Lanes went to the movies. Mr. Lane bought 2 tickets for 45 cents each and 2 tickets for 60 cents each. How much did he pay in all?

Taking Movies



1. Allen and his father decided they wanted to take their own movies. They could buy a small movie camera for $49.95, or a larger camera for $130. How much more did the larger camera cost?

2. To show their movies, they needed a projector and a screen. They could get a low-priced projector for $74.50 and a small screen for $14.95. A better projector cost $99.50 and a larger screen $22.50. Find the difference in cost between the lower-priced outfit and the better outfit.

3. They decided to get the larger camera, the better projector, and the larger screen (see Problems 1 and 2). How much did they pay in all?

4. Film that takes pictures in natural colors cost $10.85 a roll. Film that takes pictures in black and white costs $7.92 a roll. How much more would 4 rolls of color film cost than 4 rolls of black and white film? (Can you work this a short way?)

5. If a 100-foot roll of color film costs $10.85 and a 50-foot roll costs $7.15, how much will Allen and his father save by buying a 100-ft. roll instead of two 50-ft. rolls?

6. In the first 100 feet of movies Allen took, 10 feet were spoiled. What fractional part of the 100 feet could be used?

7. It takes 4 minutes to show 100 feet of film. How many feet are shown in a minute? Then how many minutes will it take Allen to show a 350-foot reel of film?

8. To make a reel of movies of a summer trip, Allen's father bought 4 rolls of film at $10.85 a roll, and had 12 titles made at a cost of 30 cents for each title. What was the total cost of the reel?

Thinking About Numbers

1. What number is one third of 18?

2. Sixty is 10 times what number?

3. Ten is what fractional part of 16?

4. What two numbers will divide 15 exactly?

5. What number will divide both 14 and 21 exactly?

6. What number is 5 times as large as 10?

7. What number added to 6 gives 13?

8. What number do you subtract 5 from to get 9?

9. What number multiplied by 7 gives 28?

10. What number divided by 3 gives 6?

11. Is 149 nearer 100 or 200?

12. Supply the missing number: 9, 11, 13, 15, ?, 19.

13. In the number 36,562, the first 6 (at the left) has how many times the value of the other 6?

14. What numbers do you add to check $1\frac{1}{3} - \frac{2}{3} = \frac{2}{3}$?

15. What other division fact belongs with $24 \div 6 = 4$?

16. What subtraction fact belongs with $8 + 8 = 16$?

Buying by Mail

This year, Bill is treasurer of his baseball club. Here is an order he is making out to send to a sporting goods company.

How Many	*Items*	*Price Each*	*Total Price*		*Shipping Weight*	
			Dollars	*Cents*	*Lb.*	*Oz.*
1	Fielder's glove	3 79	3	79	1	4
1 pr.	Baseball shoes, 5C	4 65	4	65	2	8
3	Baseballs	1 89				24
2	Bats	1 39			6	

Copy and finish Bill's order.

1. How much did the 3 baseballs cost in all? Write this number in the "Total Price" column of your order.

2. How much did the 2 bats cost? Write this amount where it belongs.

3. Add your "Total Price" column to find the total cost. What is the total cost?

4. Add the "Shipping Weight" column. Be sure to change the number of ounces in your sum to pounds and ounces. What is the total shipping weight of Bill's order?

Bill's order was to be shipped by parcel post, and Bill had to send enough money to pay the postage. Here is part of the table he used to find how much postage to pay.

Parcel Post Rates			
SHIPPING WEIGHT	ZONES 1 and 2 Not over 150 miles	ZONE 3 151 to 300 miles	ZONE 4 301 to 600 miles
Over 8 oz. to 1 lb.	23¢	23¢	24¢
1 lb. 1 oz. to 2 lb.	27¢	29¢	31¢
2 lb. 1 oz. to 3 lb.	31¢	34¢	38¢
3 lb. 1 oz. to 4 lb.	35¢	39¢	45¢
4 lb. 1 oz. to 5 lb.	39¢	44¢	52¢
5 lb. 1 oz. to 6 lb.	43¢	49¢	59¢
6 lb. 1 oz. to 7 lb.	47¢	54¢	66¢
7 lb. 1 oz. to 8 lb.	51¢	60¢	73¢
8 lb. 1 oz. to 9 lb.	55¢	65¢	80¢
9 lb. 1 oz. to 10 lb.	59¢	70¢	87¢
10 lb. 1 oz. to 11 lb.	63¢	75¢	93¢
11 lb. 1 oz. to 12 lb.	67¢	80¢	$1.00

5. Bill lives 200 miles from the store which is to ship his order. That means that Bill lives in Zone 3. If Bill's order weighed 4 lb. 5 oz., the postage on it would be 44¢. If his order weighed 9 lb., how much would postage be?

6. Look at your answer to Problem 4 and look up the amount in the table. How much money did Bill have to include for postage with his order?

Use the table to find the postage on these shipments:

	a	*b*
7.	3 lb. 7 oz. in Zone 1	8 lb. 11 oz. in Zone 1
8.	15 oz. in Zone 1	3 lb. in Zone 2
9.	10 lb. 8 oz. in Zone 3	5 lb. 1 oz. in Zone 4
10.	12 oz. in Zone 3	2 lb. 14 oz. in Zone 4

Page 281 provides enrichment material which may be used after this page.

Don's Garden

During the summer, Don makes money by selling vegetables from his garden. Don finds that gardening takes quite a lot of arithmetic. Here are some of the problems he has to solve.

1. Last spring, Don bought a new rake for $1.75 and a hoe for $1.59. He spent $2.98 for garden hose, and $5.68 for fertilizer. How much did all these things cost him?

2. How much less did Don pay for fertilizer (Problem 1) than for equipment (new tools and hose)?

3. Don planned to plant a tenth of his garden in peas, a third in corn, and a fourth in tomatoes. What fraction of his garden was he going to use for these three vegetables? What fraction was left for other vegetables?

4. Don bought 3 packets of peas to plant. They cost 25 cents a packet. He figures that about $1.20 of the cost of fertilizer and equipment should be charged to the peas. What were the total expenses for the peas?

5. Don picked 2 bushels of peas and sold them at an average price of 15 cents a quart. How much money did he receive for his peas?

6. Use your answers to Problems 4 and 5 to find how much more money Don received for his peas than they cost him.

7. Don's expenses for corn were 95 cents for seed and $4.00 for fertilizer and equipment. He sold a total of 47 dozen ears of corn at an average price of 50 cents a dozen. How much money did Don clear on his corn?

8. Don bought 5 dozen tomato plants at 35 cents a dozen. He charged $3 of the cost of fertilizer and equipment to the tomatoes. In addition, he spent $2.10 for stakes and $1.50 for materials to spray the tomatoes. How much did it cost Don to raise his tomatoes?

9. Don sold 146 pounds of tomatoes at an average price of 14 cents a pound. If his expenses for tomatoes (Problem 8) are subtracted, how much more money did Don get for his tomatoes than they cost him?

10. He planted beans, squash, beets, and broccoli in the rest of his garden. For these vegetables, he spent $1.25 for seed, and charged $3.80 of the cost of fertilizer and equipment. He received $3.85 for beans, $4.10 for squash, $2.50 for beets, and $5.49 for broccoli. How much more did Don get for these vegetables than they cost him?

11. Find how much more than his expenses Don got from his whole garden last summer. You can find this by adding his profits from each part of his garden. You can check your answer by adding his receipts from each part of his garden, then adding his expenses for each part, and subtracting his total expenses from his total receipts.

Keeping Cash Accounts

Don keeps a record of the money he makes from his garden and the money he spends on his garden. Such a record is called a **cash account**. Here is Don's cash account for a week in June.

Date	Money Received		Date	Money Spent	
June 17	Cash on hand	$ 7 68	June 19	Seeds	$ 35
18	Vegetables sold	75		Fertilizer	2 50
21	Vegetables sold	1 80	20	Hoe	1 49
23	Vegetables sold	3 09	23	Balance	
		$13 32			$13 32

1. How much money did Don have at the beginning of the week (June 17)?

2. How much did he get for the vegetables he sold during the week?

3. How much did he spend on June 19?

4. How much did he spend during the week?

5. To find how much money he should have at the end of the week (June 23), Don subtracted what he had spent during the week from $13.32, the total in the "Money Received" column. This amount is called the **balance** because it balances (makes the same) the two sides of the account.

The balance has been left out of Don's cash account. What should it be?

Don checked his balance by counting the money he had left at the end of the week. The money he had should be the same as the amount marked "Balance" in his cash account.

Don started his cash account for the next week by entering this week's balance as "Cash on hand" on June 24.

Sally's father gives her an allowance of $1.50 a week which she can spend as she likes. Sally also earns money in different ways. She keeps a record of the money she gets and the money she spends. Here are the items in Sally's cash account for a week in December. Copy and finish it.

Received				Spent			
Dec. 5	Cash on hand	$4	86	Dec. 5	Church	$	15
6	Allowance	1	50	8	Christmas presents	1	89
7	Baby Sitting	1	25	12	Movies		35
9	Reading to Grandmother		50		Ice Cream		20
12	Cleaning house		75	12	Balance		

6. What should be the total for the "Received" column?

7. How much did Sally spend?

8. What should be the balance on Dec. 12?

9. When Sally counted her money at the end of the week, she found she had only $5.77. She was sure the money received was correct. How much had she spent without recording it?

10. Allen keeps his accounts by the month. Here are his receipts and expenditures for the month of May.

Receipts: Cash on hand on May 1, $7.09; Allowance, $5; errands, 75¢; mowing lawn, $2.50; washing car, $2.75; work in garden, $1.35.

Expenditures: Film, $1.26; pictures printed, $2.78; share in baseball, 64¢; gift to mother, $1; church, 60¢; book, $2; candy and soda, 97¢; savings, $5.

Find Allen's balance at the end of May.

A School Savings Bank

Some pupils in Don's room started a school savings bank. They thought it would be easier for them to save money if they had their own bank.

Don was the cashier. Each Monday morning, the pupils could bring in money to deposit. Friday afternoons, they could withdraw some of their money if they wished.

1. The day the bank was started, 18 boys and girls in Don's room brought in $12.06. What was the average amount deposited by each pupil?

2. The amounts deposited ranged from 8 cents to $1.20. How much more was the largest deposit than the smallest deposit?

3. Sue deposited 1 quarter, 2 dimes, 6 nickels, and 7 pennies. How much money did she deposit?

4. Sally deposited 1 half dollar, 3 dimes, and 4 nickels. How much money did she deposit?

5. The next Monday, \$9.57 was deposited. No money had been taken out. How much money should there have been in the bank then? (See Problem 1)

6. Whenever there was more than \$25 in the school bank, the teacher deposited \$25 in a bank in town. One Monday, there was \$33.27 in the school bank. How much was left, if \$25 was taken to town for deposit?

Each depositor had an account book. Here is part of Don's own account.

Date	Deposited	Withdrawn	Total on Deposit
Feb. 5	\$1.05		\$4.95
9		\$.50	4.45

7. How much money did Don have in the bank on Feb. 5 before he deposited \$1.05.

8. On Feb. 12, Don deposited \$1.75. On Feb. 16 he withdrew 50 cents. Copy Don's account above and enter these two additional amounts. How much did Don have on deposit on Feb. 16?

9. On Feb. 19, Don deposited 85 cents. What was his total on deposit then?

10. One Friday, Sam withdrew \$1. He said, "Please give me 1 half dollar, 1 quarter, and the rest in nickels." How many nickels should Sam get?

11. Jill had deposits of \$1.50, 95¢, and \$1.10 in the bank. She withdrew \$1, 55¢, and 40¢. How much more money did she deposit in the bank than she drew out?

12. Sue's deposits were 82¢, 57¢, \$1.03, and 66¢. She withdrew \$1.38 to buy her mother a Christmas present. How much did she have left in the bank then?

Can You Compute?

Diagnostic Check Test 2A

This test will help you check up on your skills in handling whole numbers, fractions, and measures.

Copy, add, and check.

	a	b	c
1.	8 ft. 11 in. 10 ft. 7 ft. 9 in.	4 lb. 7 oz. 15 oz. 2 lb. 8 oz.	5 min. 29 sec. 4 min. 47 sec. 5 min. 6 sec.

Copy, subtract, and check.

2.	5 gal. 2 gal. 1 qt.	30 yr. 4 mo. 12 yr. 9 mo.	11 hr. 5 min. 9 hr. 45 min.

Copy and do what the signs tell you to.

	a	b
3.	$4678 + 953 + 7029 + 12786$	$60974 \div 89$
4.	$574 + 69 + 894 + 8 + 64$	506×708
5.	$\$96.85 + \$47.09 + \$72.18 + \$8.96$	$\$20 - \$9.05$
6.	$\$7.50 + 96¢ + \$10.48 + \$7 + \$15$	$160 \times \$18.25$
7.	$\$260.78 + \$1746.08 + \$937.69$	$\$23.25 \div 34$

8. Find the product of 97 and 48.

9. Find the difference between 918 and 306.

Copy and add.

	a	b	c	d	e
10.	$5\frac{1}{2}$ $2\frac{9}{10}$	$4\frac{7}{8}$ $6\frac{3}{8}$	$7\frac{1}{2}$ $2\frac{1}{3}$	$6\frac{7}{8}$ $12\frac{11}{16}$	$10\frac{3}{4}$ $9\frac{2}{3}$

Copy, subtract, and check.

11.	6 $2\frac{5}{12}$	$8\frac{5}{8}$ $3\frac{1}{4}$	$10\frac{1}{5}$ $9\frac{1}{2}$	$12\frac{1}{3}$ $7\frac{5}{6}$	$9\frac{1}{4}$ $2\frac{2}{3}$

Do You Understand Numbers?

Diagnostic Check Test 2B

This test will show you how much you have learned about the meaning of numbers and their relationships.

1. Find the total of 368 + 368 + 368 + 368 + 368 + 368 in a short way.

2. How many zeros do you use when you write the number 160 million in figures?

3. Round off 396,258 to the nearest 100,000.

4. Write three thousand four in figures.

5. Write the largest five-place number you can with five different figures or digits.

6. In the number 2079, what is the value of the figure 7?

7. Which is longer, 5 ft. 10 in. or 69 in.?

8. Which is longest, $\frac{1}{8}$ in., $\frac{1}{16}$ in., $\frac{1}{4}$ in., or $\frac{1}{32}$ in.?

9. How many 36's are there in 1728?

10. What number is 37 more than 29?

11. Sixty-four is how many times as large as 16?

12. What numbers do you add to check $1000 - 387 = 613$?

13. A pint is what part of a gallon?

14. How many minutes are there in $\frac{3}{4}$ hour?

15. What word means 2000 lb.?

16. Six is what fractional part of 9?

17. Write the fraction whose numerator is 7 and whose denominator is 12.

18. Change $\frac{14}{8}$ to a mixed number in lowest terms.

19. $\frac{7}{8}$ inch is how many times as long as $\frac{1}{8}$ inch?

20. What sign is missing in the example $\frac{1}{2}$? $\frac{1}{3} = \frac{1}{6}$?

Can You Use Arithmetic?

Diagnostic Check Test 2C

This test will show you how well you can use the arithmetic you have learned in solving problems.

After you have worked the problems, read them again to make sure your answers are reasonable.

1. Nora still has 70 pages of her book to read. She can read 20 pages an hour in this book. How many hours will it take her to finish?

2. Bob sold $5\frac{3}{4}$ dozen eggs last week and $4\frac{2}{3}$ dozen this week. How many dozen eggs did he sell in both weeks?

3. Bill and Tom are in a relay team. Bill can run his fourth of the distance in $14\frac{2}{5}$ seconds, while Tom's best time is $15\frac{1}{2}$ seconds. How much faster is Bill's time?

4. So far this week, Don has worked 7 hr. 45 min. for his father. He wants to work 10 hours in all. How much longer must he work?

5. Bob and his father are doing some painting in their house. Last week they used 1 gal. 1 qt. of paint. This week they have used 3 qt. of paint. How much paint have they used in the two weeks?

6. Three boys mowed lawns together. One Saturday they mowed a lawn for \$1.50 and a smaller lawn for 75 cents. They shared the money equally. How much did each boy get?

7. In cooking a roast, Mrs. Gray allows 20 minutes for each pound. She wants to have a 6-pound roast cooked by 6 o'clock. At what time should she put it in the oven?

8. At 40 cents an hour, how much will Sue earn by working 3 hours and 30 minutes?

9. Sue's mother bought 10 yards of dress goods. She used $3\frac{3}{4}$ yards to make a dress for Sue and $1\frac{1}{2}$ yards to make an apron. How many yards were left?

10. Bill charged 50 cents an hour for mowing lawns for his neighbors. One Saturday, he worked $2\frac{1}{4}$ hours on one lawn and $1\frac{3}{4}$ hours on another lawn. How much did he earn that day?

11. Sam is going to get up at 5:00 a.m. to go fishing. At what time should he go to bed in order to get 9 hours sleep?

12. According to Bill's watch, it is quarter of 8. But Bill's watch is 3 minutes fast. What is the correct time?

13. Peggy's Girl Scout troop sold cookies to raise money. They sold 42 boxes of cookies at 3 boxes for a dollar. How much money did they take in?

14. In a basketball game, our high school team made 17 field goals and 13 foul goals. Each field goal counts 2 points and each foul goal 1 point. How many points did the team make?

15. The 28 pupils in Jerry's room gave a party for their parents. They spent \$1.28 for lemonade and 96 cents for cookies. They shared the cost equally. How much was each one's share?

16. During his vacation at the seashore last summer, Tony dug a quart of clams. A clam digger told Tony clams were selling for \$8 a bushel. How much was Tony's quart of clams worth?

17. Sally bought a toothbrush for 55 cents and 2 tubes of toothpaste at 39 cents each. She handed the clerk two dollars. How much change should she receive?

One Use of Fractions

1. One Saturday, Tom earned money by delivering 120 handbills. After he had delivered 80 of the 120 bills, he wondered what part of the bills he had delivered.

He had delivered $\frac{80}{120}$ of them. You can reduce $\frac{80}{120}$ to lowest terms. Divide both terms by 10, and then divide both terms again by 4. $\frac{80}{120} = \frac{8}{12} = ?$

One use of fractions is to find what part one number is of another number.

2. Nora's book has 240 pages. Nora has read 180 pages. To find what part of her book she has read, reduce $\frac{180}{240}$ to lowest terms. Divide both terms of the fraction by 10, then by 2, and then by 3. Can you do this in a shorter way? What part of her book has Nora read?

Find what part:

	a	*b*	*c*
3.	8 is of 12	12 is of 16	30 is of 36
4.	50 is of 60	150 is of 300	200 is of 480

Another Use of Fractions

1. Nancy must practice $\frac{2}{3}$ of an hour. To find how many minutes she must practice, find $\frac{2}{3}$ of 60.

Think, "$\frac{1}{3}$ of 60 = 20. Then $\frac{2}{3}$ of 60 = 2 × 20, or ?"

How many minutes must Nancy practice?

Another use of fractions is to find a part of a number.

2. Don worked 45 minutes. If he is paid 40 cents an hour, how much did he earn?

45 minutes = $\frac{3}{4}$ of an hour. So find $\frac{3}{4}$ of 40 cents.

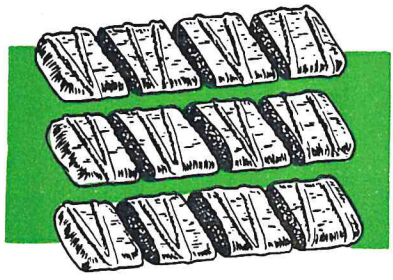
How much did Don earn?

3. If cheese is 80 cents a pound, how much should Sally pay for a piece of cheese weighing 14 ounces? 14 ounces = $\frac{14}{16}$ or $\frac{7}{8}$ of a pound. $\frac{7}{8}$ of 80 = ?

Copy and finish these examples.

	a	*b*	*c*
4.	$\frac{1}{8}$ of 32 = ?	$\frac{3}{8}$ of 32 = ?	$\frac{1}{6}$ of 60 = ?
5.	$\frac{5}{6}$ of 60 = ?	$\frac{1}{10}$ of 80 = ?	$\frac{7}{10}$ of 80 = ?
6.	$\frac{1}{4}$ of 60 = ?	$\frac{3}{4}$ of 60 = ?	$\frac{2}{3}$ of 120 = ?

Multiplying by Fractions



1. Four girls have 3 candy bars which they want to share equally. Each girl gets $\frac{1}{4}$ of each of the three bars. Look at the picture of the candy bars. How many *fourths* does each girl get?

$\frac{1}{4}$ of $3 = \frac{3}{4}$

Finding $\frac{1}{4}$ of 3 is the same as multiplying $\frac{1}{4} \times 3$.

$\frac{3}{4} \times 75 = \frac{225}{4} = 56\frac{1}{4}$, or $57¢$

2. Sally bought $\frac{3}{4}$ pound of cheese costing 75 cents a pound. To find what $\frac{3}{4}$ pound costs, multiply $\frac{3}{4} \times 75$. This is the same as finding $\frac{3}{4}$ of 75. You can think of this multiplication as $\frac{3 \times 75}{4}$, or $\frac{225}{4}$, and then change $\frac{225}{4}$ to a mixed number. You multiplied the whole number, 75, by the numerator of your fraction, $\frac{3}{4}$. $\frac{225}{4} = 56\frac{1}{4}$.

Since Sally cannot pay $\frac{1}{4}$ cent, she must pay another whole cent, or 57 cents, for the cheese.

To multiply a whole number by a fraction, multiply the numerator and the whole number, and divide by the denominator.

Copy and find the products.

	a	*b*	*c*	*d*
3.	$\frac{2}{3} \times 2$	$\frac{1}{2} \times 7$	$\frac{1}{4} \times 6$	$\frac{3}{4} \times 6$
4.	$\frac{3}{4} \times 10$	$\frac{5}{6} \times 10$	$\frac{7}{8} \times 12$	$\frac{5}{6} \times 12$
5.	$\frac{3}{4} \times 30¢$	$\frac{5}{8} \times 30¢$	$\frac{2}{3} \times 98¢$	$\frac{5}{6} \times 72¢$

Count any fraction of a cent in an answer as another whole cent.

Multiplying by Mixed Numbers

1. Jill's mother said she would pay Jill 50 cents an hour for helping clean the house. One Saturday morning, Jill worked $2\frac{3}{4}$ hours. To find how much she earned, multiply \$.50 by $2\frac{3}{4}$.

First multiply by $\frac{3}{4}$:

$$\frac{3}{4} \times 50 = \frac{150}{4} = 37\frac{1}{2}.$$

Now multiply 50 by 2 and add the partial products. How much should Jill's mother pay her?

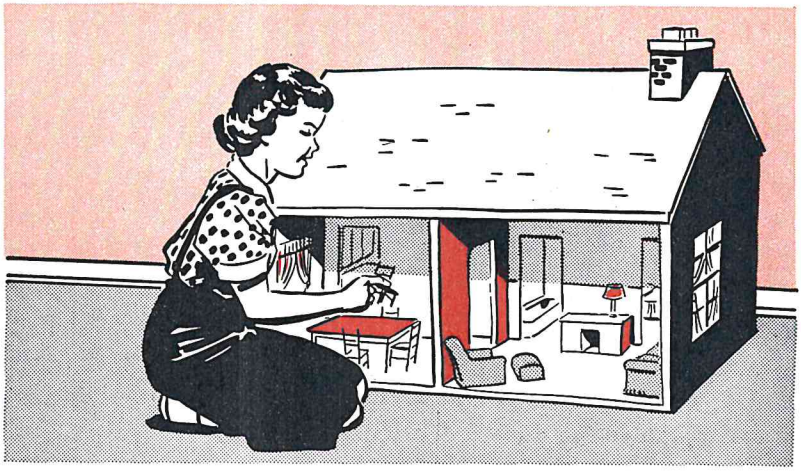
$$\begin{array}{r} \$\ .50 \\ 2\frac{3}{4} \\ \hline 37\frac{1}{2} \\ 100 \\ \hline \$1.37\frac{1}{2} \end{array}$$

Copy and multiply.

	a	*b*	*c*	*d*	*e*
2.	$24 \times 2\frac{1}{8}$	$15 \times 1\frac{2}{3}$	$36 \times 4\frac{2}{3}$	$48 \times 3\frac{3}{4}$	$25 \times 3\frac{1}{2}$
3.	$18 \times 6\frac{3}{4}$	$48 \times 2\frac{5}{8}$	$60 \times 4\frac{5}{6}$	$52 \times 3\frac{3}{8}$	$75 \times 1\frac{3}{4}$
4.	$\$.50 \times 3\frac{1}{4}$	$\$.35 \times 2\frac{1}{2}$	$\$.72 \times 4\frac{5}{8}$	$\$.40 \times 5\frac{2}{3}$	$\$.60 \times 7\frac{3}{5}$

Pages 282 and 283 provide enrichment material which can be used after this page.

Ann's Doll House



Ann's father promised to make her a one-story doll house. He and Ann decided what rooms they wanted. Then they made this scale drawing to show the size of each room.

<table>
<tr><td>Kitchen</td><td>Bath-
room</td><td>Bedroom</td></tr>
<tr><td>Dining Room</td><td colspan="2">Living Room</td></tr>
</table>

The scale of this plan of the doll house is 1 inch to 8 inches. This means that each inch on the plan stands for 8 inches in the doll house. This scale may be written $1'' = 8''$. What does the sign ($''$) mean here?

$$\begin{array}{r} 8 \\ 4\frac{1}{8} \\ \hline 1 \\ 32 \\ \hline 33 \end{array}$$

1. The plan is $4\frac{1}{8}''$ long, so the length of the doll house will be $4\frac{1}{8} \times 8''$. Multiply 8 by $4\frac{1}{8}$. How many inches long will the house be? How much more than 2 feet are 33 inches?

$$\begin{array}{r} 8 \\ 2\frac{3}{4} \\ \hline 6 \\ 16 \\ \hline 22 \end{array}$$

2. The plan is $2\frac{3}{4}''$ wide. The house will be $2\frac{3}{4} \times 8$ inches wide. Multiply 8 by $2\frac{3}{4}$. How many inches wide will the house be? How much more than 1 foot is the width?

3. With a ruler, measure the length of the kitchen in the plan to the nearest eighth of an inch. How many inches long is it? Then how many inches long will the kitchen in the doll house be?

4. Measure the width of the kitchen in the plan to the nearest quarter inch. How many inches wide is the kitchen? How many inches wide will the kitchen in the doll house be?

5. Measure the dimensions (the length and width) of the dining room in the floor plan, and find the length and width of the dining room in the doll house.

6. Find the dimensions of the bathroom in the scale drawing and then in the doll house.

7. How many inches long will the bedroom in the doll house be? How many inches wide?

8. How long will the living room in the doll house be? How wide?

Pages 284 and 285 provide enrichment material which can be used after this page.

Changing Measures

1. Mrs. Lane wanted to mail a package weighing 2 lb. 3 oz. Since there was writing in the package, the package would have to go first class. The first-class postage rate is 3 cents an ounce.

To find out how much the postage cost, you must first change 2 lb. 3 oz. to ounces. You have learned that you *multiply* to change a larger unit of measure to a smaller unit. A pound is a larger unit than an ounce, so to change 2 lb. 3 oz. to ounces you multiply 2 × 16 ounces and add 3 ounces. How many ounces did the package weigh? At 3 cents an ounce, how much was the postage?

2. Don picked $\frac{3}{4}$ bushel of peas, which he wanted to sell by the quart. To change a larger unit (bushel) to a smaller unit (quart), multiply. $\frac{3}{4} \times 32 = \frac{96}{4} = ?$

Don got 15 cents a quart for his peas. How much did he receive for $\frac{3}{4}$ bushel of peas?

$$\begin{array}{r} 12 \\ 5\frac{3}{4} \\ \hline 9 \\ 60 \\ \hline 69 \end{array}$$

3. Dick had a board $5\frac{3}{4}$ feet long. He wanted to saw off a piece 17 inches long. To find how many inches would be left, first change $5\frac{3}{4}$ feet to inches. $5\frac{3}{4} \times 12$ inches $= 69$ inches.

After Don had sawed off 17 inches from the board, how many inches were left?

Copy and find the missing numbers.

	a	*b*
4.	4 ft. 8 in. = ? in.	1 hr. 12 min. = ? min.
5.	$\frac{7}{8}$ lb. = ? oz.	$\frac{2}{3}$ ft. = ? in.
6.	$\frac{3}{8}$ bu. = ? qt.	$\frac{5}{6}$ hr. = ? min.
7.	$1\frac{1}{2}$ lb. = ? oz.	$2\frac{3}{4}$ ft. = ? in.
8.	$1\frac{1}{4}$ yd. = ? in.	$2\frac{1}{4}$ hr. = ? min.

$$\begin{array}{r} \$\ .42 \\ 3\frac{1}{3} \\ \hline 14 \\ 126 \\ \hline \$1.40 \end{array}$$

9. To make a window screen, Dick needed a piece of wire netting 40 inches long. The netting cost 42 cents a foot.

To find how much Dick had to pay for 40 inches of netting, you must first change 40 inches to feet. You have learned that you *divide* to change a smaller unit of measure to a larger unit. An inch is smaller than a foot, so you divide 40 inches by 12. $40 \div 12 = 3\frac{4}{12} = 3\frac{1}{3}$. Now multiply \$.42 by $3\frac{1}{3}$. How much did Dick have to pay for the netting?

Copy these examples and finish them by filling in the missing fractions in lowest terms.

	a	*b*	*c*
10.	69 in. = 5 ? ft.	40 oz. = 2 ? lb.	32 mo. = 2 ? yr.
11.	45 in. = 1 ? yd.	90 min. = 1 ? hr.	72 qt. = 2 ? bu.
12.	27 in. = ? yd.	14 oz. = ? lb.	24 qt. = ? bu.

	a	*b*
13.	3 lb. 12 oz. = 3 ? lb.	2 gal. 2 qt. = 2 ? gal.
14.	8 ft. 9 in. = 8 ? ft.	2 bu. 12 qt. = 2 ? bu.
15.	3 yd. 18 in. = 3 ? yd.	4 hr. 20 min. = 4 ? hr.

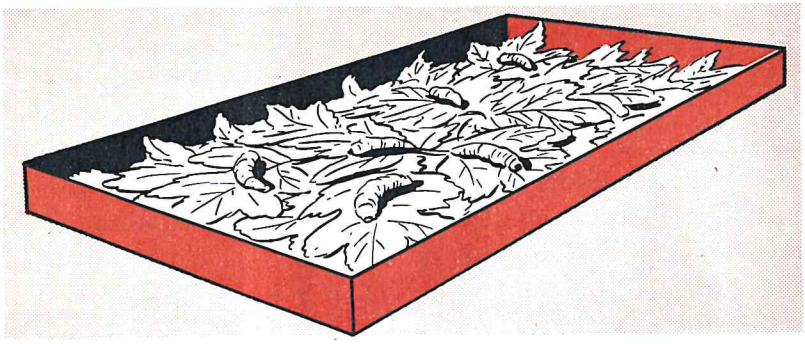
16. Sally bought 4 ounces of dried beef. At \$1.40 a pound, how much did the 4 ounces of dried beef cost her?

17. Peggy worked 75 minutes. At 40 cents an hour, how much did she earn?

18. Mrs. Lane bought a meat roast weighing 6 lb. 12 oz. At 60 cents a pound, how much did the roast cost?

19. When apples were selling for \$3 a bushel, how much should Don get for a 16-quart basket of apples?

Raising Silkworms



1. The pupils in Tom's room were interested in silkworms. They bought 24 silkworm eggs on May 9. On May 12, the first egg hatched, and on May 18 the last silkworms came out. How many days longer did the last eggs take to hatch than the first egg? How many times as long?

2. Only 20 of the 24 eggs hatched, and 4 of these 20 silkworms died. What part of the 24 eggs produced strong, living silkworms?

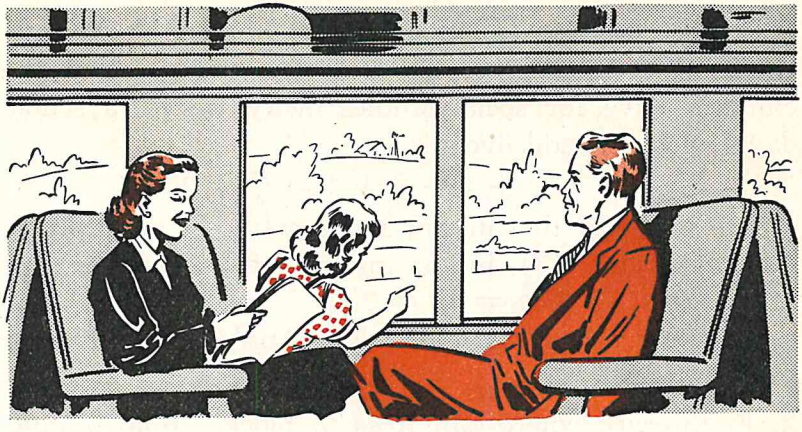
3. The silkworms were $\frac{1}{8}''$ long when they hatched. When they were full-grown, they were $3\frac{1}{2}''$ long. How many inches did they grow?

4. One day, Tom brought in 40 mulberry leaves for the 16 worms to eat. How many leaves was that for each worm on the average?

5. The first worm started to make its cocoon on June 21. From the date it hatched (May 12) to June 21 is how many days?

6. Tom read that the thread in one cocoon is about 3000 ft. long, and that it takes about 3000 cocoons to make a pound of silk. About how many million feet of thread are there in one pound of silk?

A Trip to the City



1. Last week, Jill's father and mother took her to the city on the train. Their train left their home station at 8:48 a.m. and arrived at the city at 9:36 a.m. How long did the trip take?

2. It was 32 miles from their town to the city. How long did it take their train to go one mile on the average?

3. The railroad fare for a round trip was $1.96. Jill rode for half fare. How much did they pay for all three tickets?

4. Jill's lunch cost 95 cents, her mother's lunch cost $1.35, and her father's cost $1.50. Her father left a half-dollar tip. What was the total cost of the lunch, including the tip?

5. After lunch, they went to the theater. The three tickets cost $1.65 each. Jill's father bought her a box of candy in the theater for 75 cents. How much did they spend for their afternoon at the theater?

6. What was the total cost of the trip? What was the average cost for each person?

A Whole Number Times a Fraction

1. Ann's class has 45 minutes, or $\frac{3}{4}$ hour, for social studies every morning. To find how many hours the children have for social studies every week (5 school days), you can add five $\frac{3}{4}$'s.

$$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{15}{4} = ?$$

You can find the answer more easily by multiplying the numerator (3) by 5, instead of adding the five numerators. $5 \times \frac{3}{4} = \frac{15}{4} = ?$

How many hours a week does Ann's class have for social studies?

2. In the city where Bill lives, 8 blocks equal a mile. Each block is $\frac{1}{8}$ mile long. It is 12 blocks from Bill's house to the movie theatre. To find how many miles it is to the movies, multiply $\frac{1}{8}$ by 12.

$$12 \times \frac{1}{8} = \frac{12}{8} = 1\frac{4}{8} = ?$$

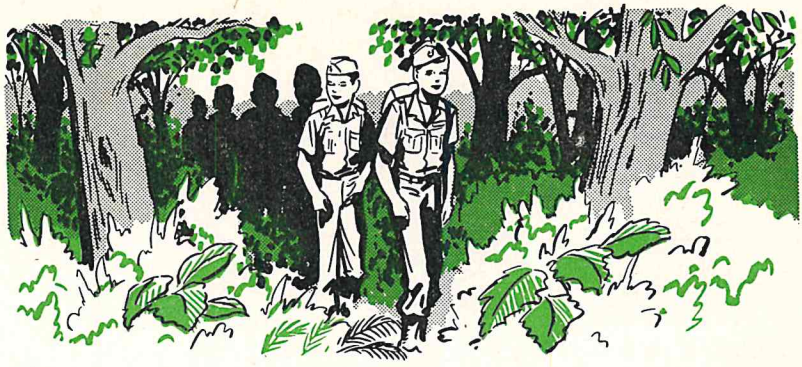
How many miles is it from Bill's house to the movies?

To multiply a fraction by a whole number, multiply the numerator by the whole number, and divide by the denominator.

Copy and multiply. Fractions in the answers should be in lowest terms.

	a	*b*	*c*	*d*
3.	$5 \times \frac{1}{4} = ?$	$9 \times \frac{1}{6} = ?$	$4 \times \frac{1}{2} = ?$	$6 \times \frac{1}{3} = ?$
4.	$10 \times \frac{1}{4} = ?$	$12 \times \frac{1}{3} = ?$	$6 \times \frac{1}{10} = ?$	$12 \times \frac{1}{8} = ?$
5.	$8 \times \frac{1}{5} = ?$	$8 \times \frac{1}{12} = ?$	$6 \times \frac{3}{5} = ?$	$7 \times \frac{2}{3} = ?$
6.	$20 \times \frac{1}{8} = ?$	$12 \times \frac{3}{4} = ?$	$5 \times \frac{3}{10} = ?$	$2 \times \frac{5}{6} = ?$
7.	$10 \times \frac{3}{8} = ?$	$7 \times \frac{4}{5} = ?$	$15 \times \frac{1}{6} = ?$	$3 \times \frac{5}{12} = ?$
8.	$12 \times \frac{2}{5} = ?$	$6 \times \frac{9}{10} = ?$	$8 \times \frac{7}{12} = ?$	$9 \times \frac{5}{6} = ?$

Multiplying Mixed Numbers



1. Bill's Boy Scout troop took a hike. They walked at a steady rate of $3\frac{1}{2}$ miles an hour. To find how far they could walk in 3 hours, multiply $3\frac{1}{2}$ by 3.

$$\begin{array}{r} 3\,\frac{1}{2} \\ \times\quad 3 \\ \hline 1\,\frac{1}{2} \\ 9 \\ \hline 10\,\frac{1}{2} \end{array}$$

Here you are multiplying a mixed number by a whole number. First multiply $\frac{1}{2}$ by 3. $3 \times \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}$. Then multiply 3×3. The 9 is written under the 1. Why? Add the partial products. How far could the troop walk in 3 hours?

Copy and multiply. Answers must be in lowest terms.

	a	b	c	d	e
2.	$1\frac{1}{2}$ × 4	$2\frac{1}{3}$ × 2	$2\frac{1}{6}$ × 3	$4\frac{1}{8}$ × 6	$1\frac{1}{10}$ × 8
3.	$3\frac{1}{5}$ × 5	$7\frac{2}{3}$ × 4	$5\frac{3}{4}$ × 6	$9\frac{5}{8}$ × 4	$8\frac{2}{3}$ × 7
4.	$3\frac{5}{6}$ × 9	$8\frac{3}{5}$ × 6	$6\frac{5}{12}$ × 9	$14\frac{1}{4}$ × 7	$22\frac{7}{8}$ × 5
5.	$46\frac{2}{5}$ × 4	$20\frac{7}{10}$ × 3	$57\frac{2}{9}$ × 5	$92\frac{3}{8}$ × 9	$17\frac{3}{16}$ × 6

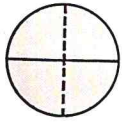
Multiplying Fractions by Fractions

1. One Saturday, Don picked a melon in his garden. He gave $\frac{1}{2}$ of the melon to his mother to use for dinner, and he shared the other half with Bob and Sam. Each boy got $\frac{1}{3}$ of the $\frac{1}{2}$ melon. Look at the picture. How much is $\frac{1}{3}$ of $\frac{1}{2}$?

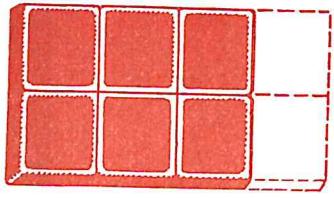
To find $\frac{1}{3}$ of $\frac{1}{2}$, multiply $\frac{1}{3}$ by $\frac{1}{2}$. (When you multiply fractions, "of" means "times.") Multiply the two numerators (1×1) to get the new numerator. Multiply the two denominators (3×2) to get the new denominator.

$$\frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{3 \times 2} = ?$$

How much of the melon did each boy get?



2. Draw a circle like the one at the left. Shade $\frac{1}{2}$ of $\frac{1}{2}$ of your circle. What part of the circle is $\frac{1}{2} \times \frac{1}{2}$?



3. Bob bought a chocolate bar. He ate $\frac{1}{4}$ of it. The dotted line shows the part Bob ate.

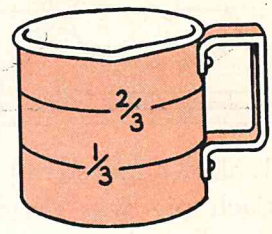
Bob told Sue she could have $\frac{1}{2}$ of the $\frac{3}{4}$ of the bar that was left.

To find $\frac{1}{2}$ of $\frac{3}{4}$, multiply $\frac{1}{2} \times \frac{3}{4}$. $\frac{1}{2} \times \frac{3}{4} = ?$

How much of the chocolate bar could Sue have?

4. Look at a ruler divided into eighth inches. What is $\frac{1}{2}$ of $\frac{1}{2}$ inch? What is $\frac{1}{2}$ of $\frac{1}{4}$ inch? What is $\frac{1}{2}$ of $\frac{3}{4}$ inch?

5. A recipe calls for $\frac{2}{3}$ cup of sugar. Sue wants to make only half of the recipe. To find how much sugar she will use, multiply. $\frac{1}{2} \times \frac{2}{3} = ?$ What part of a cup of sugar will Sue use?



To multiply a fraction by a fraction, multiply the numerators to get the new numerator. Multiply the denominators to get the new denominator. Be sure the new fraction is reduced to lowest terms.

Copy and multiply. Be sure your answers are in lowest terms.

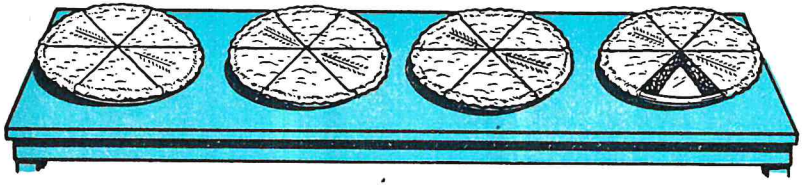
	a	*b*	*c*	*d*
6.	$\frac{1}{2} \times \frac{1}{3} = ?$	$\frac{1}{4} \times \frac{1}{2} = ?$	$\frac{1}{3} \times \frac{1}{4} = ?$	$\frac{1}{2} \times \frac{1}{6} = ?$
7.	$\frac{1}{3} \times \frac{3}{4} = ?$	$\frac{1}{2} \times \frac{5}{6} = ?$	$\frac{1}{3} \times \frac{3}{10} = ?$	$\frac{1}{5} \times \frac{5}{8} = ?$
8.	$\frac{1}{4} \times \frac{2}{3} = ?$	$\frac{2}{3} \times \frac{1}{4} = ?$	$\frac{3}{4} \times \frac{1}{2} = ?$	$\frac{2}{3} \times \frac{1}{2} = ?$
9.	$\frac{1}{2} \times \frac{7}{10} = ?$	$\frac{3}{4} \times \frac{4}{5} = ?$	$\frac{1}{6} \times \frac{3}{4} = ?$	$\frac{3}{4} \times \frac{5}{6} = ?$
10.	$\frac{2}{3} \times \frac{3}{8} = ?$	$\frac{2}{3} \times \frac{3}{4} = ?$	$\frac{3}{4} \times \frac{2}{5} = ?$	$\frac{2}{3} \times \frac{5}{6} = ?$
11.	$\frac{3}{5} \times \frac{2}{3} = ?$	$\frac{7}{8} \times \frac{1}{2} = ?$	$\frac{1}{2} \times \frac{5}{6} = ?$	$\frac{3}{8} \times \frac{4}{5} = ?$

12. Sue found this recipe for "the best Brownies in America." She wants to make half the recipe to try it out. How much of each ingredient will she use?

$\frac{1}{2}$ cup butter
1 cup sugar
2 eggs
2 squares bitter chocolate, melted
$\frac{3}{4}$ cup sifted flour
$\frac{2}{3}$ cup nut meats
1 teaspoon vanilla

13. Sally has $\frac{5}{6}$ yd. of material and wants to use $\frac{1}{3}$ of it. $\frac{5}{6} \times \frac{1}{3} = ?$ How many inches is this?

Changing Mixed Numbers



1. Jim counted $3\frac{5}{6}$ apple pies on the cafeteria counter. Each pie was divided into sixths. Jim wondered how many sixths there were in $3\frac{5}{6}$.

In 1 pie there are $\frac{6}{6}$. In 3 pies there are $3 \times \frac{6}{6}$ or $\frac{18}{6}$, so in $3\frac{5}{6}$ pies there are $\frac{18}{6} + \frac{5}{6}$, or $\frac{?}{6}$.

2. After a picnic there were $2\frac{3}{4}$ melons left. Don's father said the children could each take home a fourth of a melon. To find how many fourths there were, change the mixed number $2\frac{3}{4}$ to an improper fraction.

There are $\frac{4}{4}$ in 1 melon. In 2 melons there are $2 \times \frac{4}{4}$ or $\frac{8}{4}$. Then in $2\frac{3}{4}$ melons there are $\frac{8}{4} + \frac{3}{4}$, or $\frac{?}{4}$.

3. Change $5\frac{2}{3}$ to an improper fraction.

$$5\tfrac{2}{3} = (5 \times \tfrac{3}{3}) + \tfrac{2}{3} = \tfrac{15}{3} + \tfrac{2}{3} = ?$$

To change a mixed number to an improper fraction, multiply the whole number by the denominator and add the numerator. Write the denominator under this sum.

4. Tell how you change $3\frac{2}{5}$ to an improper fraction.

Copy the following mixed numbers and change them to improper fractions by filling in the missing numerators.

	a	b	c	d
5.	$2\frac{1}{2} = \frac{?}{2}$	$1\frac{2}{3} = \frac{?}{3}$	$1\frac{3}{4} = \frac{?}{4}$	$2\frac{3}{8} = \frac{?}{8}$
6.	$3\frac{1}{4} = \frac{?}{4}$	$3\frac{1}{3} = \frac{?}{3}$	$1\frac{4}{5} = \frac{?}{5}$	$4\frac{2}{5} = \frac{?}{5}$
7.	$3\frac{5}{8} = \frac{?}{8}$	$9\frac{1}{2} = \frac{?}{2}$	$5\frac{2}{3} = \frac{?}{3}$	$4\frac{1}{6} = \frac{?}{6}$
8.	$2\frac{5}{6} = \frac{?}{6}$	$3\frac{3}{10} = \frac{?}{10}$	$6\frac{1}{8} = \frac{?}{8}$	$3\frac{5}{12} = \frac{?}{12}$

Multiplying With Mixed Numbers

1. Sam's father keeps an outboard motorboat on the lake. It can go $8\frac{1}{2}$ miles an hour. It took it $1\frac{2}{3}$ hours to go from one end of the lake to the other. To find how long the lake is, multiply $8\frac{1}{2}$ by $1\frac{2}{3}$.

$$8\tfrac{1}{2} \times 1\tfrac{2}{3} =$$
$$\tfrac{17}{2} \times \tfrac{5}{3} =$$
$$\tfrac{85}{6} = 14\tfrac{1}{6}$$

First, change each mixed number to an improper fraction, then multiply as with other fractions. Change the product, $\frac{85}{6}$, to a mixed number. How long is the lake?

When multiplying with mixed numbers, you may find it easier first to change the mixed numbers to improper fractions.

Copy and multiply. First change the mixed numbers to improper fractions.

	a	b	c	d
2.	$1\frac{2}{3} \times 2\frac{1}{2}$	$2\frac{1}{3} \times 4\frac{1}{6}$	$1\frac{1}{4} \times 3\frac{2}{5}$	$4\frac{1}{2} \times 5\frac{1}{3}$
3.	$\frac{1}{2} \times 3\frac{2}{3}$	$\frac{2}{3} \times 2\frac{3}{4}$	$\frac{3}{4} \times 2\frac{1}{2}$	$\frac{5}{8} \times 1\frac{3}{4}$
4.	$3\frac{1}{2} \times 4$	$6 \times 4\frac{2}{3}$	$1\frac{1}{2} \times \frac{3}{4}$	$2\frac{2}{3} \times \frac{7}{8}$
5.	$1\frac{5}{6} \times 2\frac{2}{3}$	$3\frac{1}{2} \times \frac{5}{8}$	$2\frac{1}{3} \times 1\frac{5}{6}$	$\frac{1}{2} \times 6\frac{3}{4}$
6	$3 \times 2\frac{1}{6}$	$4\frac{3}{8} \times 5\frac{1}{2}$	$\frac{1}{6} \times 7\frac{1}{3}$	$4\frac{1}{8} \times 2\frac{3}{4}$

Pages 286 and 287 provide enrichment material which can be used after this page.

A Short Cut in Multiplying

1. If Don works in his garden $1\frac{3}{4}$ hours every day, how many hours will he work in 6 days this week?

To find out, multiply $1\frac{3}{4}$ by 6. First change $1\frac{3}{4}$ to a fraction. $6 \times 1\frac{3}{4} = 6 \times \frac{7}{4} = \frac{42}{4} = 10\frac{2}{4} = 10\frac{1}{2}$

If you think of the multiplication as $\frac{6 \times 7}{4}$, you can shorten your work by cancellation. To cancel you divide a numerator and a denominator by the same number.

$$6 \times 1\frac{3}{4} = \frac{\overset{3}{\cancel{6}} \times 7}{\underset{2}{\cancel{4}}} = \frac{21}{2} = 10\frac{1}{2}$$

By what number did you divide both 6 and 4?

$\frac{\overset{3}{\cancel{12}}}{\underset{4}{\cancel{16}}} = \frac{3}{4}$

2. When you reduce $\frac{12}{16}$ to lowest terms, you really cancel in your head. By what number do you divide both terms of $\frac{12}{16}$?

3. Dick wants to buy a $2\frac{2}{3}$ foot board for a shelf. The board costs 36¢ a foot. Multiply to find how much he must pay. $2\frac{2}{3} \times 36 = \frac{8}{\underset{1}{\cancel{3}}} \times \overset{12}{\cancel{36}} = ?$

4. Sam is riding his bicycle at the rate of $10\frac{1}{2}$ miles an hour. He has been riding for $1\frac{1}{3}$ hours. To find how far he has gone, multiply $10\frac{1}{2}$ by $1\frac{1}{3}$. You can cancel twice.

$$1\frac{1}{3} \times 10\frac{1}{2} = \frac{\overset{2}{\cancel{4}}}{\underset{1}{\cancel{3}}} \times \frac{\overset{7}{\cancel{21}}}{\underset{1}{\cancel{2}}} = ?$$

Copy and multiply. Cancel where possible.

	a	*b*	*c*	*d*
5.	$2\frac{1}{4} \times 3\frac{1}{2}$	$1\frac{1}{2} \times 2\frac{2}{3}$	$12 \times 2\frac{3}{4}$	$2\frac{1}{6} \times 16$
6.	$3\frac{1}{3} \times 12$	$5\frac{1}{2} \times 7$	$4 \times 1\frac{3}{10}$	$2\frac{3}{4} \times 6\frac{2}{3}$
7.	$2\frac{3}{4} \times 6$	$1\frac{1}{3} \times 3\frac{5}{6}$	$5\frac{3}{4} \times 6$	$6\frac{2}{3} \times 7\frac{1}{2}$

Are your answers reasonable?

Can You Use Zeros?

Are you sure what to do when you add, subtract, multiply, and divide with zeros? These examples will help you find out.

Copy and complete these examples.

	a	*b*	*c*	*d*
1.	$7+0=?$	$0+0=?$	$5-0=?$	$0-0=?$
2.	$8\times0=?$	$0\times4=?$	$0\times0=?$	$0\div6=?$

Copy, add, and check.

	a	*b*	*c*	*d*	*e*
3.	289	5070	\$ .09	\$13.90	\$ 34.81
	600	460	.41	7.07	404.39
	67	3455	.20	56.67	92.99
	508	848	.03	20.09	509.08
	50	1207	.27	5.30	39.40

Copy, subtract, and check.

4.	130	106	212	804	600
	40	36	59	305	591
5.	3000	8033	\$1.06	\$20.00	\$100.90
	804	7630	.80	12.59	77.82

Copy, multiply, and check.

6.	40	57	208	710	609
	5	6	5	20	30
7.	3007	806	500	\$9.50	\$10.08
	74	608	120	40	9 70

Copy, divide, and check.

8.	$4\overline{)200}$	$7\overline{)425}$	$5\overline{)4030}$	$23\overline{)1380}$	$60\overline{)3000}$
9.	$13\overline{)780}$	$36\overline{)7488}$	$400\overline{)9600}$	$18\overline{)\$91.08}$	$50\overline{)\$17.00}$

Using Fractions in Problems

Can you use in problems the fractions you have had so far? Read each problem carefully and decide first whether you will add, subtract, or multiply to solve it. If you are not sure, perhaps thinking of whole numbers instead of fractions will help you.

You may be able to work some of the problems as quickies. Be sure your answers are reasonable.

1. Jean is squeezing oranges to make orange juice for breakfast. Each orange makes $\frac{3}{8}$ glass of juice. How many glasses of juice will Jean get from 12 oranges?

2. Sally bought $1\frac{3}{4}$ yards of ribbon at 18 cents a yard. How much did she pay?

3. Bill's troop of Boy Scouts hiked $4\frac{7}{8}$ miles one Saturday and $6\frac{3}{4}$ miles the next Saturday. How much farther did they go the second Saturday?

4. Sally's mother bought a steak that weighed $2\frac{3}{4}$ pounds and a ham weighing $7\frac{1}{2}$ pounds. How many pounds of meat did she buy?

5. Don's father had $\frac{3}{4}$ of a bag of fertilizer left one spring. He told Don he could have $\frac{1}{3}$ of it for his garden. What part of a bag did he give Don?

6. It is $1\frac{7}{8}$ miles from Dick's house to the store. How far does Dick go when he walks from his house to the store and back? (There are two ways to find this.)

7. Bob's spring chickens weigh $1\frac{3}{4}$ lb. each, on the average. How much will 6 of these chickens weigh?

8. Bill drinks $\frac{3}{4}$ quart of milk a day. How many quarts does he drink in a week?

9. It took us $1\frac{2}{3}$ hours to drive to grandfather's house for Thanksgiving dinner. Then snow began to fall. The drive home took $3\frac{1}{2}$ hours. How much longer did it take us to come back than to go?

10. Ann is planning to make two doll dresses for her little niece's birthday. Each dress takes $\frac{5}{8}$ yards of cloth. How much cloth should Ann buy for the two dresses?

11. Barbara bought a half-pound box of candy. She gave Linda and Mary each $\frac{1}{3}$ of her candy. What part of a pound did each girl get?

12. Last year, Don sold $7\frac{1}{2}$ dozen ears of early corn and $13\frac{2}{3}$ dozen ears of late corn from his garden. How many dozen ears of corn did he sell altogether?

13. The gasoline tank in our car holds 18 gallons. The gauge shows that the tank is $\frac{3}{4}$ full. How many gallons of gasoline are there in the tank?

14. Joe and some other boys have formed a band. The boys told Joe they would practice 3 hours on Saturday. They have already practiced $1\frac{1}{4}$ hours. How much longer should they practice?

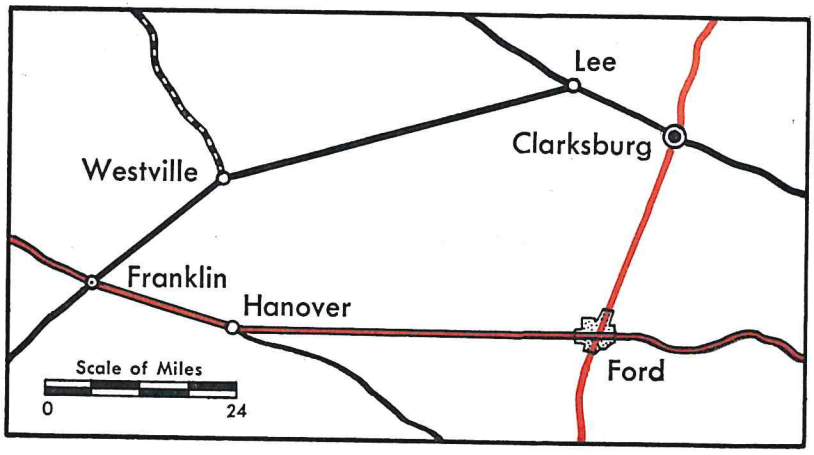
15. Sue has a recipe which calls for $1\frac{3}{4}$ cups of flour. She wants to make $\frac{1}{2}$ of this recipe. How much flour will she use?

16. Sue is making a layer cake. She needs $1\frac{1}{4}$ cups of sugar for the cake and $2\frac{2}{3}$ cups of sugar for the icing. How much sugar does she need?

17. Mrs. Lane bought some meat. It weighed $3\frac{5}{8}$ lb. At 60¢ a pound, how much did Mrs. Lane pay for the meat?

18. Bill's Boy Scout troop has been hiking for $1\frac{1}{4}$ hours at the rate of $3\frac{1}{2}$ miles an hour. How many miles have the boys gone?

Using Maps



1. Mr. Lane wants to drive from Franklin to Clarksburg by the shortest route. Since his road map does not show the number of miles on these roads, he asked Tony to use the scale on the map and find how far it was by each of the two routes. The scale on the map was 1 inch to 24 miles. That is, each inch on the map represented 24 miles. How many miles did each quarter inch on the map stand for?

2. Tony measured to the nearest eighth inch the number of inches between each two towns and multiplied by 24 to find the distance in miles. Then he added to find how many miles it was by each route. First he found the distance from Franklin to Clarksburg by way of Hanover and Ford.

From Franklin to Hanover is $\frac{3}{4}$ in. or 18 mi.
From Hanover to Ford is $1\frac{7}{8}$ in. or ? mi.
From Ford to Clarksburg is ? in. or ? mi.

How many miles is it from Franklin to Clarksburg by way of Hanover and Ford?

3. Then Tony measured the distance from Franklin to Clarksburg by way of Westville and Lee.

From Franklin to Westville is ? in. or ? mi.
From Westville to Lee is ? in or ? mi.
From Lee to Clarksburg is ? in. or ? mi.

How many miles is it from Franklin to Clarksburg by way of Westville and Lee?

4. How many miles will Mr. Lane save by using the shorter route? Can you think of a shorter way of solving Mr. Lane's problem than the way Tony used?

5. Tom found a map of his state in which one inch represented 50 miles. On the map, it is $3\frac{1}{2}$ inches from the city where Tom lives to the state capital. How many miles does Tom live from the capital?

6. On a map with a scale of 1 in. = 200 mi., it is $4\frac{1}{4}$ inches from Karen's city to the seashore. How many miles is this distance?

7. If the scale of a map is 1 inch to 400 miles, how many miles are represented by $2\frac{3}{4}$ inches?

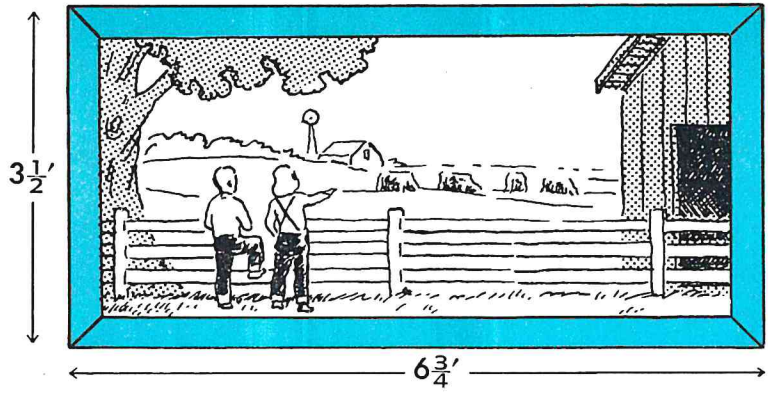
8. How many miles are $7\frac{7}{8}$ inches if the scale of a map is 1 in. = 40 mi.?

9. On a map of the township in which Sue lives, the scale is $\frac{1}{4}$ in. = 1 mi. How many miles does each inch on the map represent? On the map, it is $1\frac{3}{4}$ inches from Sue's home to the town where the Grays do their shopping. How many miles is it from Sue's home to town?

10. Suppose you want to draw a map with the scale of 1 inch to 10 miles. How long would you make a line to represent 20 miles? 25 miles? 15 miles?

Pages 288 and 289 provide enrichment material which can be used after this page.

Finding the Perimeter



1. The pupils in Jean's room painted a large picture for the school cafeteria. The boys wanted to make a frame for the picture. The frame would be $6\frac{3}{4}$ feet long and $3\frac{1}{2}$ feet wide. To find how much picture molding they needed to make the frame, they had to find the perimeter, or distance around the frame.

There are several ways to find the perimeter of a rectangle. You can add the four sides. Or you can add one end and one side and multiply the sum by 2. Can you think of another way?

1st Way	2nd Way
$6\frac{3}{4}$	$6\frac{3}{4}$
$3\frac{1}{2}$	$3\frac{1}{2}$
$6\frac{3}{4}$	$10\frac{1}{4}$
$3\frac{1}{2}$	$2 \times 10\frac{1}{4} =$
$20\frac{1}{2}$	$20\frac{1}{2}$

How many feet of molding did the boys need to make the picture frame?

2. Linda is hemstitching an edge for a table runner $1\frac{1}{2}$ ft. wide and $4\frac{1}{8}$ ft. long, as a present for her mother. Draw a picture of the runner, using the scale of $1'' = 1'$. Find how many feet of hemstitching Linda must do.

3. Mary is crocheting around a handkerchief. The handkerchief is a square. Each side is $11\frac{1}{2}$ inches long. To find how much edging Mary must crochet, you can add $11\frac{1}{2}'' + 11\frac{1}{2}'' + 11\frac{1}{2}'' + 11\frac{1}{2}''$. It is easier to multiply. $4 \times 11\frac{1}{2}'' = ?$ in.

4. Bob wants to make a square pen for his young chickens. Each side of the pen will be $10\frac{3}{4}$ feet long. Bob will enclose the pen with a wire fence. How many feet of wire fencing must he get?

5. Mrs. Gray has just bought a tablecloth. It is $4\frac{1}{3}$ ft. wide and $5\frac{2}{3}$ ft. long. Sue is going to hem the tablecloth for her mother. How many feet must Sue hem?

6. Find the length of a fence enclosing one of Jill's flower beds. The flower bed is a triangle, and the sides are $12\frac{1}{2}$ ft., $8\frac{1}{4}$ ft., and $6\frac{2}{3}$ ft.

7. Sally is helping her mother put some trimming around the edge of a quilt 108 inches long and 72 inches wide. The trimming is bought by the yard. How many yards of trimming will they need?

Find the perimeter of each of the following figures. Estimate each answer before you find it. For instance, your estimate for Example 8 might be a little more than 30 inches. Why?

8. A rectangle $5\frac{3}{8}''$ wide and $10\frac{3}{4}''$ long.

9. A square with each side $4\frac{5}{8}''$ long.

10. A rectangle $6\frac{2}{3}$ yd. wide and $12\frac{3}{4}$ yd. long.

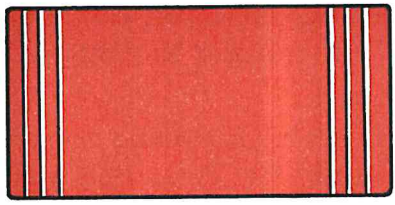
11. A triangle with sides $9\frac{1}{4}'$, $10\frac{2}{3}'$, and $6\frac{1}{2}'$.

12. A rectangle 298 yd. long and 109 yd. wide.

13. A triangle with sides 93 yd., 52 yd., and 69 yd.

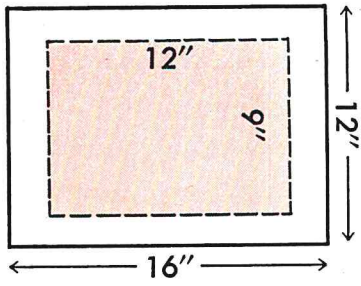
14. A square with each side $1\frac{5}{6}$ miles long.

Finding the Area of Rectangles



1. The drawing at the left shows a bath mat Ann knitted for the bathroom in her doll house. The mat was 4 in. long and 2 in. wide.

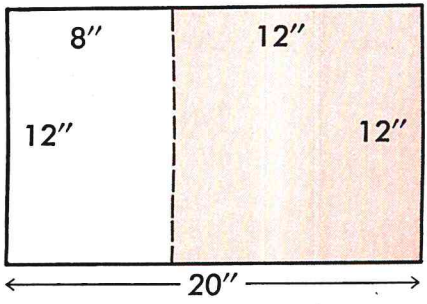
The area of the mat is the number of square inches in it. How many square inches are there? 4 × 2 = ? sq. in.



2. Ann had a rug 9″ by 12″ for her doll house dining room. The drawing shows how the rug fitted on the floor of the dining room.

What is the area of the rug? 9 × 12 = ? sq. in. What is the area of the dining room floor? 12 × 16 = ? sq. in.

To find the area of a rectangle, multiply the length by the width.



3. This drawing shows the living room in Ann's doll house. Ann has a square piece of linoleum. Each side is 12 in. long. It contains 1 square foot. Ann wants to use the linoleum in the living room. How many square inches are there in 1 square foot?

If Ann uses the linoleum, how many square inches of the floor would not be covered?

1 square foot = 144 square inches

4. Does a rectangle 8″ by 20″ (8 inches wide by 20 inches long) have an area of more, or less, than 1 sq. ft.? How many square inches more or less?

5. One of the following rectangles has an area of just 1 square foot. Which one is it?

a. 10″×16″ **b.** 8″×16″ **c.** 9″×16″ **d.** 11″×13″

6. If a rectangle is 16″ long, how wide must it be to have an area of 1 square foot?

7. If a rectangle is 8″ wide, how long must it be to have an area of 1 square foot?

8. Allen has a camera that takes pictures $2\frac{1}{2}'' \times 3\frac{1}{2}''$. To find the area of each picture, multiply $2\frac{1}{2}$ and $3\frac{1}{2}$.

$$2\tfrac{1}{2} \times 3\tfrac{1}{2} = \tfrac{5}{2} \times \tfrac{7}{2} = \tfrac{35}{4} = ? \text{ sq. in.}$$

9. A square is a special kind of rectangle. It is a rectangle with all four sides the same length. What is the area of a square with sides $4\frac{1}{4}$ inches long?

$$4\tfrac{1}{4} \times 4\tfrac{1}{4} = ? \text{ sq. in.}$$

10. A rectangle is 2 ft. long and 18 inches wide. To find how many square inches it contains, change 2 feet to inches and multiply the number of inches by 18. How many square inches does the rectangle contain?

Find the number of square inches in each of the rectangles below. Be sure the units are the same before you multiply. After you work all the examples, look over your answers. Are they reasonable?

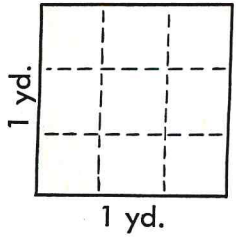
	a	*b*	*c*
11.	2 in. × 3 in.	3 in. × 5 in.	8 in. × 10 in.
12.	10 in. × 1 ft.	2 in. × $3\frac{1}{2}$ in.	4 in. × $4\frac{1}{2}$ in.
13.	$3\frac{1}{4}$ in. × 6 in.	3 in. × $4\frac{1}{2}$ in.	$3\frac{1}{2}$ in. × $4\frac{1}{2}$ in.
14.	$2\frac{1}{4}$ in. × $3\frac{1}{4}$ in.	18 in. × 3 ft.	15 in. × 2 ft.

Using Square Measure

1. Don's garden is 90 ft. by 120 ft. (90 ft. wide and 120 ft. long). He is putting fertilizer on it at the rate of 1 pound for each 48 sq. ft. To find how many pounds of fertilizer Don should use, first find the number of square feet in the garden. $90 \times 120 = ?$ sq. ft.

Now divide by 48. How many pounds of fertilizer will Don need?

2. Mrs. Lane has a rug $7\frac{1}{2}$ ft. by 10 ft. How many square feet are there in the rug? It will cost 8 cents a square foot to have the rug cleaned. How much must Mrs. Lane pay to have the rug cleaned?



3. Sally is cutting square table mats from 1 square yard of material. Each mat is a square 1 foot long and 1 foot wide, and contains 1 square foot. How many mats can Sally get? Then how many square feet are there in a square yard?

1 square yard = 9 square feet

4. Jerry's father is going to have a new concrete sidewalk laid in front of his house. The walk will be 32 yd. long and $1\frac{1}{2}$ yd. wide, and will cost \$3.75 a square yard. He wants to know how much he must pay.

First find the number of square yards, by multiplying 32 by $1\frac{1}{2}$. Then multiply \$3.75 by the number of square yards.

How much will the sidewalk cost?

5. The Grays' porch floor is 25 ft. long and 8 ft. wide. Mr. Gray wants to buy enough paint to paint it. One quart of paint will paint 100 sq. ft. Find the area of the porch floor and how much paint is needed.

How many quarts of paint should Mr. Gray buy?

6. If 1 pound of grass seed will seed 200 sq. ft. of lawn, how many pounds will Linda's father need to seed a lawn 60 ft. by 80 ft.

7. One pint of lawn spray will cover 4000 sq. ft. The lawn in front of Bill's house is 60 ft. by 75 ft. If Bill's father gets only one pint of lawn spray, how much of his lawn will not be covered?

8. Mrs. Gray would like to buy a linen table cloth about 6 ft. wide and 9 ft. long. How many square feet does the cloth contain? How many square yards? At \$2.70 a square yard, how much will the tablecloth cost?

9. Ann's mother wants to buy a wall-to-wall carpet for her dining room. The room is 15 feet wide and 18 feet long. What is the area of the room in square yards?

If the carpet Ann's mother wants costs \$12.50 a square yard, how much will the new dining room carpet cost?

10. Jean has a sheet of gold paper 20 inches wide and 28 inches long. How many squares 2 inches on a side can she cut from the paper? (Show two ways to find this.)

How Large Is an Acre?

1. Don's father was going to put fertilizer on his apple orchard. He wanted to put 600 lb. of fertilizer on each acre. Since he was not sure just how many acres were in the orchard, he and Don measured it. They used a chain one rod long. A rod is $5\frac{1}{2}$ yd. How many feet $= 5\frac{1}{2}$ yd.?

It is easy to use rods in measuring acres, for there are 160 square rods in an acre.

$$\frac{\overset{1}{\cancel{20}} \times \overset{4}{\cancel{40}}}{\cancel{160}\ \cancel{16}\ \cancel{4}\ 1} = 20$$

2. Don and his father found that the apple orchard was 80 rd. long and 40 rd. wide. To find how many acres this is, divide the number of square rods (80×40) by 160. You can write (80×40) $\div$ 160 as a fraction, and use cancellation. You can first divide both 40 and 160 by 10, then divide 4 and 16 by 4, then divide 80 and 4 by 4. Tell how you can cancel in other ways.

How many acres were there in the orchard?

$$\frac{\overset{1}{\cancel{20}} \times \overset{6}{\cancel{600}}}{\cancel{2000}\ \cancel{100}\ 1} = 6$$

3. To put 600 lb. of fertilizer on each acre, how many tons of fertilizer would Don's father have to buy? To find out, multiply 600 by 20 and divide by 2000 (the number of pounds in a ton).

Explain how cancellation is used in the work shown in the box. Now work this example by multiplying 20×600 and dividing the product by 2000. Did you get the same answer? How many tons were needed?

Find the number of acres in each of the following rectangles.

	Length	Width		Length	Width
4.	20 rd.	8 rd.	**7.**	50 rd.	18 rd.
5.	16 rd.	10 rd.	**8.**	60 rd.	48 rd.
6.	32 rd.	20 rd.	**9.**	100 rd.	70 rd.

10. A piece of land, shaped like a rectangle, is 32 rods long. How many rods wide must it be to have an area of exactly 1 acre?

11. A rectangular strip of ground is 4 rods wide. How long must it be to contain one acre?

12. Bill knew that a football field is 300 feet long and 160 feet wide. He wondered if this is more or less than an acre.

It is harder to use square feet in measuring acres than to use rods, for there are 43,560 sq. ft. in an acre. Find how many square feet there are in a football field. How many square feet more or less than an acre is this?

13. Ellen's house is on a lot 150 ft. wide and 200 ft. deep. To *estimate* what part of an acre this is, you can divide 150 × 200 by 200 × 200, because a square 200 ft. by 200 ft. is a little less than an acre.

a. Find how much less than an acre is contained in a square 200 ft. × 200 ft.

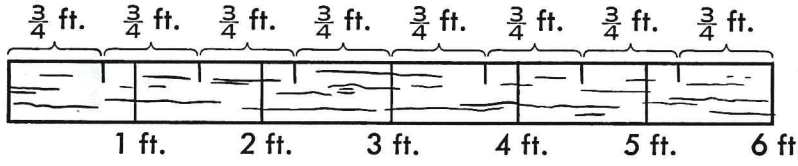
b. Use cancellation to find *about* what part of an acre Ellen's lot is.

$$\frac{150 \times 200}{200 \times 200} = ? \text{ acre}$$

14. There are 640 acres in a square mile. Jim's uncle owns a ranch containing 1920 acres. How many square miles does the ranch contain?

Pages 290 and 291 provide enrichment material which can be used after this page.

Whole Numbers Divided by Fractions



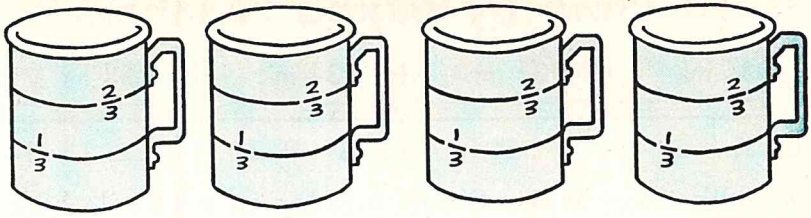
1. Dick is building bird houses. He needs some pieces of board each $\frac{3}{4}$ ft. long. He wants to know how many pieces he can get from a board that is a little more than 6 ft. long. To find out, divide 6 by $\frac{3}{4}$, just as you would divide 6 by 2 to find out how many two-foot pieces he could get.

Dick could get three two-foot pieces from a board six feet long, because $6 \div 2 = 3$. Dividing by 2 is the same as multiplying by $\frac{1}{2}$. You can change $6 \div 2$ into a multiplication example by turning 2 into $\frac{1}{2}$. $6 \times \frac{1}{2} = 3$.

In the same way, you can turn $6 \div \frac{3}{4}$ into a multiplication example. You can do it by exchanging the numerator and denominator of the fraction. This is called inverting the fraction. When you invert $\frac{3}{4}$, you get $\frac{4}{3}$. $6 \times \frac{4}{3} = ?$ How many pieces of the right length can Dick get from the long board?

2. Tom has a piece of gummed tape 7 inches long. He wants to cut it into labels $\frac{7}{8}$ inch long to use in his collection of rocks. Look at a ruler and count the number of $\frac{7}{8}$'s in 7 inches. Now divide 7 by $\frac{7}{8}$: $7 \div \frac{7}{8} = 7 \times \frac{8}{7} = ?$ Did you get the same answer both ways? How many labels will Tom get?

3. Don's mother made 3 raisin pies for a picnic. She wanted to divide the pies so that several children could have plenty of pie. How many children could share the pies if each child got $\frac{3}{8}$ of a pie? $3 \div \frac{3}{8} = 3 \times \frac{8}{3} = ?$ Check your answer by drawing 3 pies divided into 8ths.



4. Sue is helping her mother make cookies for a cookie sale at the church. She has a recipe calling for $\frac{2}{3}$ cup of sugar. Sue has 4 cups of sugar in all. To find how many times she can make this recipe, you must find how many $\frac{2}{3}$-cups there are in 4 cups.

You could find this by looking at the drawing of the 4 cups and seeing how many times you can subtract $\frac{2}{3}$ cup. How many times can Sue make the recipe?

Or you can divide 4 by $\frac{2}{3}$ by inverting the fraction and multiplying. $4 \div \frac{2}{3} = 4 \times \frac{3}{2} = ?$

To divide a whole number by a fraction, invert the divisor and multiply.

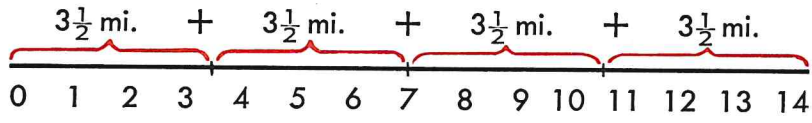
5. Sue and her mother made 6 pounds of cookies for the sale. Sue wants to know how many boxes she will need if she puts $\frac{1}{2}$ pound of cookies in each box. Divide 6 by $\frac{1}{2}$. $\frac{1}{2}$ inverted is $\frac{2}{1}$, or 2. $6 \div \frac{1}{2} = 6 \times 2 = ?$

6. Sally can get only $\frac{3}{8}$ of a glass of orange juice from each small orange. She wonders how many oranges it will take to make 5 glasses of juice. To find out, divide 5 by $\frac{3}{8}$. How many oranges does Sally need?

Copy these examples and find the quotients.

	a	b	c	d	e
7.	$5 \div \frac{1}{2}$	$3 \div \frac{1}{3}$	$2 \div \frac{1}{4}$	$4 \div \frac{1}{5}$	$3 \div \frac{1}{8}$
8.	$2 \div \frac{2}{3}$	$3 \div \frac{4}{5}$	$9 \div \frac{2}{5}$	$14 \div \frac{3}{4}$	$12 \div \frac{1}{3}$
9.	$15 \div \frac{5}{6}$	$60 \div \frac{1}{3}$	$24 \div \frac{5}{8}$	$15 \div \frac{7}{12}$	$22 \div \frac{11}{12}$

Dividing by Mixed Numbers



1. Bill's troop of Boy Scouts is going on a 14-mile hike. The boys can walk $3\frac{1}{2}$ miles an hour. You can find how many hours the hike will take by drawing a diagram like that above. It shows that in 1 hour the boys will go $3\frac{1}{2}$ miles, in 2 hours $3\frac{1}{2} + 3\frac{1}{2}$, or ? miles, in 3 hours they will go ? miles, and in 4 hours the whole 14 miles.

$$14 \div 3\tfrac{1}{2} = 14 \div \tfrac{7}{2} =$$

$$\overset{2}{\cancel{14}} \times \frac{2}{\cancel{7}_{1}} = 4$$

You can find the answer more quickly by dividing 14 by $3\frac{1}{2}$. You can divide by a mixed number just as you divide by a fraction.

Change the mixed number to a fraction, invert, and multiply.

$$\$1.80 \div 3\tfrac{3}{4} = \$1.80 \div \tfrac{15}{4} =$$

$$\overset{\$\ .12}{\cancel{\$1.80}} \times \frac{4}{\cancel{15}_{1}} = \$.48$$

2. Bob got \$1.80 for a chicken that weighed $3\frac{3}{4}$ pounds. To find how much a pound this was, divide \$1.80 by $3\frac{3}{4}$.

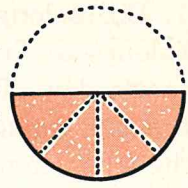
Explain how you cancel with a money number. Then work this example without canceling, and see whether you get the same answer.

Copy these examples and divide.

	a	*b*	*c*	*d*
3.	$10 \div 2\frac{1}{2}$	$9 \div 1\frac{1}{2}$	$8 \div 1\frac{1}{3}$	$15 \div 2\frac{1}{4}$
4.	$8 \div 1\frac{3}{4}$	$6 \div 1\frac{2}{3}$	$12 \div 2\frac{1}{2}$	$6 \div 1\frac{4}{5}$
5.	$14 \div 2\frac{3}{4}$	$36 \div 2\frac{2}{3}$	$\$2.25 \div 4\frac{1}{2}$	$\$3.50 \div 1\frac{3}{4}$
6.	$\$1.05 \div 1\frac{2}{3}$	$\$2.70 \div 2\frac{1}{4}$	$\$3.00 \div 7\frac{1}{2}$	$\$2.50 \div 12\frac{1}{2}$

Fractions Divided by Whole Numbers

1. Mrs. Lane had $\frac{1}{2}$ of an orange layer cake. She divided it among Jean and three other girls who were playing at Jean's house. To find what fraction of a whole cake each of the 4 girls got, divide $\frac{1}{2}$ by 4.



When 4, or $\frac{4}{1}$, is inverted, it becomes $\frac{1}{4}$.

$$\frac{1}{2} \div 4 = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

What part of the whole cake did each girl get?

2. The week of a recital, Nancy practiced her piano lesson $7\frac{1}{2}$ hours in 5 days. To find the number of hours she practiced each day on the average, divide $7\frac{1}{2}$ by 5.

$$7\tfrac{1}{2} \div 5 =$$

$$\frac{\cancel{15}^{3}}{\cancel{2}} \times \frac{1}{\cancel{5}_{1}} =$$

$$\frac{3}{2} = 1\tfrac{1}{2}$$

Change the mixed number ($7\frac{1}{2}$) to a fraction ($\frac{15}{2}$), invert the divisor (5), and multiply.

How many hours practice a day did Nancy average?

Copy and divide.

	a	*b*	*c*	*d*
3.	$\frac{5}{6} \div 2$	$\frac{3}{8} \div 6$	$\frac{1}{4} \div 3$	$\frac{15}{16} \div 5$
4.	$\frac{3}{4} \div 12$	$\frac{3}{5} \div 6$	$\frac{2}{3} \div 6$	$\frac{9}{10} \div 6$
5.	$3\frac{1}{3} \div 5$	$4\frac{1}{2} \div 3$	$2\frac{2}{3} \div 6$	$8\frac{1}{4} \div 3$
6.	$5\frac{1}{3} \div 3$	$1\frac{3}{4} \div 7$	$8\frac{1}{3} \div 5$	$10\frac{1}{4} \div 4$

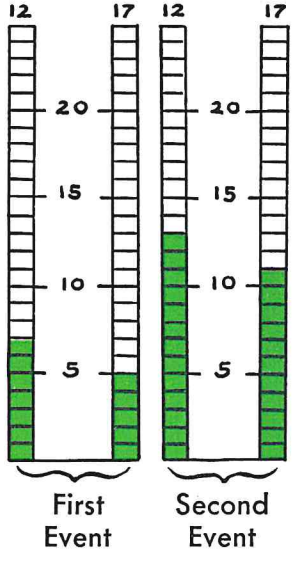
Do you remember how to invert various kinds of divisors? Invert each of these numbers.

	a	*b*	*c*	*d*	*e*	*f*
7.	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{3}$	8	$\frac{7}{10}$	$1\frac{1}{2}$
8.	$2\frac{1}{2}$	$1\frac{3}{4}$	5	$\frac{1}{2}$	$2\frac{1}{6}$	$2\frac{2}{3}$

The Scouts Have a Sports Day

1. Bill belongs to Troop 12 of the Boy Scouts and Jim belongs to Troop 17. The two troops decided to have a sports day. There are 32 boys in Bill's troop. Thirty of the boys came to the sports day. What fractional part of the troop came? $\frac{30}{32} = ?$

2. There are 36 boys in Jim's troop. Thirty of the boys in Jim's troop came. What part of Jim's troop came?



3. The boys made a pair of big thermometers as a sort of scoreboard. After each event, they marked the thermometers to show how many points each troop had scored.

The first event was some relay races. How many points did Troop 12 win in this event? How many points did Troop 17 win?

4. The second event was basketball games. After this event, how many total points do the thermometers show Troop 12 had scored? How many of these were made in the basketball games. How many total points had Troop 17 made? What was their score in the basketball games?

5. The third and last event was some tugs of war. Troop 12 scored 4 points and Troop 17 scored 8 points. Draw a pair of thermometers to show the final score.

6. How many more points did Troop 17 score in all than Troop 12? How many more than half of the total points scored did Troop 17 score?

Dividing Mixed Numbers

1. When a silkworm was hatched in Tom's room, it was only $\frac{1}{8}$ inch long. By the time it was full-grown, it was $3\frac{1}{2}$ inches long. How many times as long was it when it was full-grown?

$$3\tfrac{1}{2} \div \tfrac{1}{8} =$$

$$\frac{7}{\cancel{2}_{1}} \times \frac{\overset{4}{\cancel{8}}}{1} = 28$$

To find out, divide $3\frac{1}{2}$ by $\frac{1}{8}$.

Change the mixed number to an improper fraction, invert the divisor, and multiply. How many times as long was the silkworm?

2. Dick has a board a little more than $7\frac{1}{2}$ feet long. He wants to cut book shelves from it. Each shelf is to be $2\frac{1}{2}$ feet long. To find how many shelves Dick will get, divide $7\frac{1}{2}$ by $2\frac{1}{2}$.

$$7\tfrac{1}{2} \div 2\tfrac{1}{2} = \tfrac{15}{2} \div \tfrac{5}{2} =$$

$$\frac{\overset{3}{\cancel{15}}}{\underset{1}{\cancel{2}}} \times \frac{1}{\cancel{5}_{1}} = 3$$

Explain the work shown in the box. How many shelves will Dick get?

3. Ellen helped her mother entertain at lunch. She bought $\frac{7}{8}$ pound of mints to put in paper cups. Each cup held $\frac{1}{16}$ pound of mints. To find how many cups Ellen could fill, divide $\frac{7}{8}$ by $\frac{1}{16}$.

$$\tfrac{7}{8} \div \tfrac{1}{16} = \tfrac{7}{8} \times \tfrac{16}{1} = ?$$

How many cups could Ellen fill?

Copy and divide.

	a	b	c	d
4.	$2\frac{1}{2} \div \frac{1}{4}$	$4\frac{1}{2} \div \frac{3}{4}$	$12\frac{1}{2} \div 1\frac{1}{2}$	$2\frac{1}{2} \div 1\frac{1}{4}$
5.	$\frac{3}{4} \div \frac{3}{8}$	$4\frac{1}{2} \div 1\frac{3}{4}$	$\frac{5}{8} \div 1\frac{1}{4}$	$8\frac{1}{3} \div \frac{5}{6}$
6.	$6\frac{2}{5} \div 2\frac{2}{3}$	$8\frac{1}{3} \div \frac{2}{3}$	$\frac{7}{12} \div \frac{1}{3}$	$8\frac{3}{4} \div 1\frac{1}{4}$

Can You Divide With Fractions?

These examples will show you how much you have learned about dividing with fractions and mixed numbers.

Can you divide a whole number by a fraction?

	a	b	c	d
1.	$6 \div \frac{1}{2}$	$10 \div \frac{2}{5}$	$12 \div \frac{3}{4}$	$8 \div \frac{2}{3}$

Can you divide a money number by a fraction?

2.	$\$.80 \div \frac{1}{2}$	$\$1.25 \div \frac{1}{4}$	$\$.30 \div \frac{1}{3}$	$\$.16 \div \frac{1}{8}$
3.	$\$1.50 \div \frac{3}{4}$	$\$2.25 \div \frac{1}{5}$	$\$4.20 \div \frac{2}{3}$	$\$3.00 \div \frac{2}{5}$

Can you divide a fraction by a fraction?

4.	$\frac{2}{3} \div \frac{1}{2}$	$\frac{5}{6} \div \frac{1}{3}$	$\frac{1}{2} \div \frac{1}{8}$	$\frac{9}{10} \div \frac{3}{5}$

Can you divide a mixed number by a fraction?

5.	$2\frac{3}{4} \div \frac{1}{4}$	$3\frac{1}{2} \div \frac{1}{2}$	$4\frac{2}{3} \div \frac{2}{3}$	$2\frac{1}{2} \div \frac{3}{8}$

Can you divide a fraction by a whole number?

6.	$\frac{1}{2} \div 3$	$\frac{5}{6} \div 10$	$\frac{3}{4} \div 2$	$\frac{3}{8} \div 6$

Can you divide a mixed number by a whole number?

7.	$2\frac{1}{2} \div 5$	$2\frac{2}{3} \div 4$	$1\frac{3}{4} \div 7$	$2\frac{2}{5} \div 8$

Can you divide a whole number by a mixed number?

8.	$10 \div 2\frac{1}{2}$	$14 \div 1\frac{3}{4}$	$12 \div 1\frac{1}{3}$	$8 \div 1\frac{1}{5}$

Can you divide a money number by a mixed number?

9.	$\$1.50 \div 1\frac{1}{2}$	$\$2.00 \div 1\frac{1}{4}$	$\$2.10 \div 1\frac{3}{4}$	$\$4.00 \div 2\frac{2}{3}$
10.	$\$7.20 \div 2\frac{1}{4}$	$\$1.62 \div 2\frac{1}{4}$	$\$15.75 \div 4\frac{1}{2}$	$\$0.81 \div 1\frac{1}{8}$

Can you divide a fraction by a mixed number?

11.	$\frac{1}{2} \div 2\frac{1}{2}$	$\frac{3}{4} \div 1\frac{1}{5}$	$\frac{5}{8} \div 1\frac{1}{4}$	$\frac{5}{6} \div 2\frac{1}{2}$

Can you divide a mixed number by a mixed number?

12.	$7\frac{1}{2} \div 1\frac{1}{4}$	$8\frac{1}{3} \div 6\frac{2}{3}$	$3\frac{3}{4} \div 2\frac{1}{2}$	$5\frac{1}{4} \div 2\frac{1}{3}$

Checking Fractions

1. You know that you can check addition and subtraction with fractions just as you check addition and subtraction with whole numbers. Tell how you would check this subtraction example: $9 - 6\frac{2}{5} = 2\frac{3}{5}$.

2. You can also check multiplication and division with fractions just as you can check multiplication and division with whole numbers. You know that because $3 \times 5 = 15$, $15 \div 3 = 5$. In the same way, $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$, so $\frac{1}{6} \div \frac{1}{2} = \frac{1}{3}$. If $3\frac{1}{3} \times 2\frac{1}{4} = 7\frac{1}{2}$, then what does $7\frac{1}{2} \div 2\frac{1}{4}$ equal? What does $7\frac{1}{2} \div 3\frac{1}{3}$ equal?

3. Tell how you would check this multiplication example in two ways by dividing: $\frac{3}{4} \times \frac{2}{3} = \frac{1}{2}$.

4. Tell how you would check this division example by multiplying: $4\frac{1}{2} \div \frac{3}{4} = 6$.

5. Don cut a strip of wood $7\frac{1}{2}$ feet long into garden markers each $\frac{3}{4}$ foot long. To find how many he got, divide. $7\frac{1}{2} \div \frac{3}{4} = 10$. To check this division, multiply $10 \times \frac{3}{4}$. Is the product $7\frac{1}{2}$?

Copy and work these examples. Check each division example by multiplying, and check each multiplication example by dividing. Each check is already started for you.

	a	*b*
6.	$6 \div \frac{2}{3} = ?$ $(\frac{2}{3} \times ? = 6)$	$\frac{5}{8} \times 4 = ?$ $(? \div \frac{5}{8} = 4)$
7.	$12 \div \frac{3}{5} = ?$ $(\frac{3}{5} \times ? = 12)$	$\frac{3}{4} \div \frac{1}{6} = ?$ $(\frac{1}{6} \times ? = \frac{3}{4})$
8.	$4\frac{1}{2} \times 5\frac{1}{3} = ?$ $(? \div 4\frac{1}{2} = 5\frac{1}{3})$	$\frac{1}{2} \times \frac{4}{5} = ?$ $(? \div \frac{1}{2} = \frac{4}{5})$
9.	$8 \div 2\frac{2}{3} = ?$ $(2\frac{2}{3} \times ? = 8)$	$1\frac{1}{2} \div 6 = ?$ $(6 \times ? = 1\frac{1}{2})$
10.	$2\frac{2}{3} \times 4\frac{1}{2} = ?$ $(? \div 4\frac{1}{2} = 2\frac{2}{3})$	$3\frac{3}{4} \div 1\frac{1}{4} = ?$ $(1\frac{1}{4} \times ? = 3\frac{3}{4})$

Using Fractions in Cooking

1. Sue's recipe for muffins makes 12 muffins. It calls for $1\frac{3}{4}$ cups of flour. Sue wants to make only 6 muffins. What part of the recipe should she use? How much flour should she use?

2. Sue and Jill were making candy. The recipe called for $1\frac{7}{8}$ cups of sugar. The girls wanted to double the recipe. How much sugar should they use?

3. A recipe for biscuits called for $3\frac{1}{2}$ cups of biscuit mix and $1\frac{1}{3}$ cups of milk. How much biscuit mix would Sue use to make half of this recipe? How much milk?

4. Mrs. Gray wants to make three date-nut loaves. The following ingredients (materials) are part of the ingredients used in making one loaf:

$\frac{2}{3}$ cup sugar $\frac{1}{3}$ cup walnut meats $\frac{3}{4}$ cup dates

How much of each ingredient would Mrs. Gray use to make 3 loaves?

5. To make half of a recipe for coconut candy calling for $1\frac{3}{4}$ cups of sugar, how many cups of sugar should Sue use?

6. To make $\frac{1}{3}$ of a recipe calling for $4\frac{1}{2}$ teaspoons of baking powder, how many teaspoons of baking powder should Sue use?

7. A recipe for cherry pie filling calls for 4 cups of cherries, 2 cups of sugar, and $\frac{1}{4}$ cup of flour. Mrs. Gray has 6 cups of cherries. Since 6 is $1\frac{1}{2}$ times 4, Mrs. Gray must use $1\frac{1}{2}$ times as much sugar and flour. How much sugar must she use? How much flour must she use?

8. Sue has a recipe that will make enough corn griddle cakes to serve 6 people. She wants to make enough griddle cakes to serve 4 people. What part of the recipe does she use? Find how much of each of these ingredients she should use:

$1\frac{3}{4}$ cups milk
$1\frac{1}{4}$ cups corn meal
$4\frac{1}{2}$ teaspoons baking powder

9. Sue said she would make 30 cookies for Sally's party. A recipe to make 12 cookies calls for $\frac{3}{4}$ cup of milk. How much milk will Sue need in making 30 cookies?

10. Bill and some other boys in his Scout troop started to make popcorn balls. Bill had found this recipe which would make 8 popcorn balls.

6 cups popped corn
$\frac{1}{3}$ cup molasses
$\frac{3}{4}$ cup sugar
$\frac{1}{4}$ cup water
$\frac{2}{3}$ tablespoon vinegar
$\frac{1}{2}$ teaspoon salt
$1\frac{1}{3}$ tablespoons butter or margarine

The boys decided to make 24 popcorn balls. How much of each ingredient should they use?

Pages 292 and 293 provide enrichment material which can be used after this page.

Using Fractions in Problems

In some of these problems you multiply and in some you divide. Read each problem carefully and decide whether you should multiply or divide to solve it. Then find the answer. Is the answer reasonable?

1. If a motorboat goes $7\frac{1}{2}$ miles an hour, how long will it take to go 45 miles?

2. If Peggy walks $2\frac{2}{3}$ miles an hour, how far will she walk in $1\frac{1}{3}$ hours?

3. If Sam works $1\frac{2}{3}$ hours a day, how many hours will he work in 5 days?

4. Nancy said she would practice 3 hours this week. If she practices $\frac{3}{4}$ hour a day, how many days must she practice?

5. Sally's mother paid \$1.35 for $2\frac{1}{4}$ pounds of meat. How much a pound did the meat cost?

6. If butter is 74 cents a pound, how much will $2\frac{1}{2}$ pounds of butter cost?

7. Sally is knitting a sweater. She still has $7\frac{1}{2}$ inches to knit. If she knits $1\frac{1}{4}$ inches an hour, how many hours will it take her to finish the sweater?

8. At $87\frac{1}{2}$ cents a yard, how much must Mrs. Lane pay for $2\frac{1}{2}$ yards of material to cover sofa cushions? (Count any fraction of a cent in your answer as another cent. Why?)

9. Sam and Bob gathered $\frac{3}{4}$ bu. of walnuts and shared them equally. What part of a bushel should Sam get?

10. Dick wants to buy a sheet of plywood 4 feet wide and 8 feet long. It costs $15\frac{1}{2}$ cents a square foot. How much will the sheet of plywood cost?

Thinking About Processes

These questions will help you remember and understand the meaning of the four processes—addition, subtraction, multiplication, and division. See if you can make up a problem to illustrate each way a process is used.

1. What process do you use to find how many are left?

2. What process do you use to put unequal numbers of things together?

3. What process is a short way of putting several equal numbers together?

4. What process is a short way of subtracting a series of equal numbers?

5. What process do you use to find how much larger one number is than another number?

6. What process do you use to find how many times one number is as large as another number?

7. Which other process can you use to check, or prove, subtraction?

8. Which other process can you use to check, or prove, division?

9. What process do you use to find how many things are still needed?

10. What process do you use to find how many equal groups of things there are?

11. What process do you use to find how many things there are in each group?

12. What process must you always use to find an average? What other process may you also need to use in finding an average?

Which Process Do You Use?

These are fraction problems. You must use either addition, subtraction, multiplication, or division to solve each problem.

Number your paper 1 to 11. After each number, write $+$, $-$, $\times$, or $\div$ to show which process you use to solve that problem. Then find the answer and write it after the sign.

If you can't decide which process to use in a problem, it may help you to think of whole numbers instead of fractions. So, in Problem 1, you might think, "How many days would 4 melons last if I used 2 a day?"

1. Mrs. Gray has $2\frac{2}{3}$ honeydew melons. How many days will they last if she uses $\frac{2}{3}$ of a melon each day?

2. Nancy practiced $\frac{5}{6}$ hour Friday and $\frac{3}{4}$ hour Saturday. On which day did she practice longer? How much longer?

3. Jean wants to find how many miles one city is from another city. On a map, the cities are $2\frac{3}{8}$ inches apart. The scale of the map is $1'' = 96$ mi. What is the distance between the two cities?

4. On her eleventh birthday, Barbara was $56\frac{3}{4}$ inches tall. On her twelfth birthday, she was $60\frac{1}{8}$ inches tall. How much had she grown in a year?

5. If Jean's family uses $\frac{3}{8}$ pound of butter a day, how many pounds will they use in a month of 30 days?

6. A recipe calls for $1\frac{1}{2}$ cups of sugar. Sue has only $\frac{1}{2}$ cup of sugar. What part of the recipe can she use?

7. A wooden box filled with apples weighs $30\frac{1}{2}$ pounds. The empty box weighs $4\frac{5}{8}$ pounds. How much do the apples weigh?

8. Jill has $3\frac{1}{2}$ yards of ribbon to cut into badges. If each badge is $\frac{1}{6}$ yard long, how many badges can she make?

9. Sue made $1\frac{3}{4}$ pounds of fudge and $\frac{7}{8}$ pound of caramels. Altogether, how many pounds of candy did she make?

10. Sally is knitting mittens for Christmas presents. It takes $1\frac{3}{4}$ balls of wool for each pair. How many balls of wool does Sally need for 2 pairs?

11. Bob is $58\frac{3}{4}$ inches tall. He has an uncle who is $73\frac{1}{8}$ inches tall. How much taller than Bill is his uncle?

Can You Change Measures?

Do you remember how to change measures from larger units to smaller units? Which process do you use?

Copy and finish these examples.

	a	*b*
1.	$1\frac{1}{2}$ qt. = ? pt.	$1\frac{1}{4}$ lb. = ? oz.
2.	$1\frac{2}{3}$ hr. = ? min.	$1\frac{3}{4}$ ft. = ? in.
3.	$2\frac{1}{2}$ yr. = ? mo.	$3\frac{1}{4}$ gal. = ? qt.
4.	3 ft. 4 in. = ? in.	2 lb. 12 oz. = ? oz.
5.	2 hr. 38 min. = ? min.	1 ton 1500 lb. = ? lb.

Do you remember how to change measures from smaller units to larger units? Which process do you use?

Copy and finish these examples.

6.	10 ft. = ? yd.	9 in. = ? ft.
7.	18 in. = ? yd.	45 sec. = ? min.
8.	9 qt. = ? gal.	18 mo. = ? yr.
9.	3 lb. 8 oz. = ? lb.	2 hr. 15 min. = ? hr.
10.	5 ft. 10 in. = ? ft.	2 tons 1000 lb. = ? tons

Two-Step Fraction Quickies

These problems are all two-step problems using fractions. See whether you can work all of them as quickies "in your head." Use your pencil only to write the answers.

1. Dick had a board 8 feet long. He cut off one piece $2\frac{1}{4}$ feet long and another piece $1\frac{1}{2}$ feet long. How long was the board then?

2. Mrs. Norton is buying 2 chickens from Bob. One chicken weighs $4\frac{3}{4}$ pounds and the other weighs $5\frac{1}{4}$ pounds. Chickens are selling for 45 cents a pound. How much should she pay Bob for both chickens?

3. In 3 days, Bob worked $2\frac{1}{4}$ hours, $3\frac{1}{2}$ hours, and $3\frac{1}{4}$ hours with his chickens. How many hours did he work each day on an average?

4. Joe should practice on his trumpet for 4 hours this week. One day he practiced an hour and a half. Another day he practiced half an hour. How many more hours of practice must he get in?

5. On a fishing trip with his father, Sam caught two fish. One weighed $1\frac{3}{4}$ pounds and the other weighed $1\frac{1}{4}$ pounds. Sam's father caught only one fish, but it weighed $3\frac{1}{2}$ pounds. How much more did the big fish weigh than both of Sam's fish together?

6. Sally has 10 yards of gingham. She plans to make 4 aprons for Christmas presents. Each apron will take $1\frac{1}{2}$ yards of gingham. How many yards of gingham will Sally have left?

7. Small sausages were selling for 60 cents a pound. Mrs. Lane bought 4 half-pound packages of them. How much did the sausages cost her?

8. For a candy sale, Sue made 6 pounds of candy. She put the candy in half-pound boxes which sold for 50 cents each. How much did Sue's candy bring at the sale?

9. Mr. Lane wants to buy a turkey. One turkey weighs 15 pounds. A smaller one weighs $12\frac{1}{2}$ pounds. The turkeys cost 60 cents a pound. How much more would Mr. Lane have to pay for the larger turkey?

10. There are 2 cups of sugar in a pound. Sue opened a 2-pound box of sugar and used $1\frac{1}{2}$ cups. How many cups of sugar were left in the box?

11. A recipe for griddle cakes serving 6 persons calls for $2\frac{1}{2}$ cups of flour. Sue wants to make enough griddle cakes for just 3 persons. How many cups of flour should she use?

12. Electricity for our reading lamp costs $\frac{1}{2}$ cent an hour. If we use the lamp 3 hours a day, how much will the electricity cost for the month of April?

13. Don picked $3\frac{1}{4}$ doz. ears of corn one morning. He found that $\frac{3}{4}$ doz. ears were not good enough to sell. At 40¢ per dozen, how much did he get for the rest?

14. How much must Sally pay for $\frac{3}{4}$ pound of cheese costing 80 cents a pound, and a loaf of bread for 20 cents?

15. Sally and her mother are making a rag rug. They have two pieces of material, one $7\frac{1}{2}$ inches wide and the other $10\frac{1}{2}$ inches wide. If they tear this material into strips $1\frac{1}{2}$ inches wide, how many strips will they get from both pieces?

16. Sue's mother promised to cook 4 chickens for the grange supper. Each chicken weighs $3\frac{1}{2}$ pounds. If $\frac{1}{2}$ pound is allowed for each person, how many persons will the chickens serve?

Earning and Saving

1. Tom has a newspaper route. He pays $3\frac{1}{2}$ cents each for daily papers and sells them for 5 cents each. One afternoon he delivered 72 papers. How much money did he have after paying for his papers?

2. Tom pays 8 cents for each Sunday paper, and sells it for 10 cents. How many Sunday papers must Tom sell to earn enough to buy a Boy Scout knife for $1.50?

3. Bill is saving to buy a chemistry set that costs $12. He has saved $8.50. He earns money by mowing lawns for 50 cents an hour. How many hours will it take him to earn enough more money to buy the chemistry set?

4. Sam wants to buy a new bicycle for $38.50. He has saved $15.95 and he can get $12 for his old bicycle. How much more does he need?

5. Peggy is picking strawberries to earn money for a swim suit costing $6. She is paid 8 cents a quart for picking. How many quarts of berries must she pick to earn enough for the swim suit?

6. Dave earned $2.50 parking cars. While he was working, he spent 16 cents for a sandwich, 10 cents for a piece of cake, and 6 cents for pop. How much money did he have left to take home?

7. Nora's grandmother pays her 30 cents an hour for reading to her. One week Nora read for $3\frac{2}{3}$ hours, the next week for $4\frac{1}{4}$ hours, and the third week for $3\frac{1}{2}$ hours. How much did Nora earn in three weeks?

8. Ken and his brother are earning money to buy a $3.50 Easter lily for their mother. They have earned $2.38. How much more must each boy earn?

9. Sam and his two cousins went out to pick blueberries. Sam picked $3\frac{1}{4}$ quarts and his cousins each picked $1\frac{3}{4}$ quarts. They sold the berries for 36 cents a quart. How much money did they earn?

10. Barbara is saving for a wrist watch. She plans to save $\frac{3}{4}$ of all the money she earns. One week she worked $6\frac{1}{2}$ hours helping her mother. Her mother paid her 40 cents an hour. How much money should Barbara save that week?

11. At 40 cents an hour, how much will Barbara earn if she works 2 hr. 45 min. on Saturday morning?

Can You Round Off Numbers?

Do you remember how to round off numbers?

1. Is 452 nearer 400 or 500?

2. To the nearest ten, 929 is 930. What is it to the nearest hundred?

Round off each of the following numbers.

3. 267 to the nearest ten.

4. 1842 to the nearest hundred.

5. 4739 to the nearest 500.

6. 209,876 to the nearest thousand.

7. 1,366,412 to the nearest 100,000.

8. 317,375,248 to the nearest million.

9. $30.46 to the nearest dollar.

10. $13,500 to the nearest $5,000.

11. 8 lb. 11 oz. to the nearest pound.

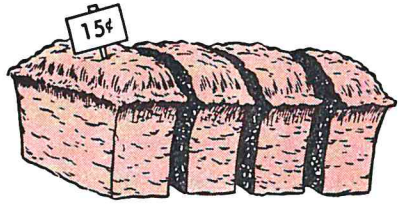
12. 9 ft. 5 in. to the nearest foot.

13. $17\frac{3}{8}$ inches to the nearest inch.

14. $6\frac{5}{8}$ inches to the nearest half inch.

15. $4\frac{11}{16}$ inches to the nearest quarter inch.

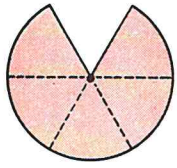
A Third Use for Fractions



1. At a food sale, Mrs. Lane bought $\frac{1}{4}$ of a large nut loaf for 15 cents. Find what the whole loaf is worth at that rate.

There are 4 fourths in the whole loaf. If one fourth costs 15 cents, 4 fourths are worth $4 \times 15¢$, or ? cents.

To check your answer, think, "Is $\frac{1}{4}$ of my answer 15 cents?"



2. Ellen bought $\frac{5}{6}$ of a cake for 75 cents. To find what the whole cake is worth, first find the cost of $\frac{1}{6}$ of the cake.

Five sixths cost 75 cents, so $\frac{1}{6}$ costs $75 \div 5$, or 15 cents. Then the whole cake is worth 6 times 15 cents, or ? cents.

Check by finding $\frac{5}{6}$ of your answer. It should be 75 cents.

On pages 130 and 131, you learned about two uses of fractions. One use was to find a part of a number. A second use was to find what part one number is of another. Now you are learning a third way to use fractions: to find the whole number when you know a part of a number.

There is a shorter way to find the whole number. When you know that 4 pounds of meat cost \$2.40, to find the cost of 1 pound you divide by 4. In the same way, when you know that $\frac{7}{8}$ lb. of cheese costs 70 cents, to find the cost of 1 pound you can divide by $\frac{7}{8}$.

$$70 \div \tfrac{7}{8} = 70 \times \tfrac{8}{7} = ? \text{ cents.}$$

3. If 6 is $\frac{1}{4}$ of a number, what is the whole number? $6 \div \frac{1}{4} = 6 \times 4 = ?$ How do you check your answer?

4. If 12 is $\frac{2}{3}$ of a number, what is the number?

Work these problems in any way you wish. Be sure to check every answer. You may be able to do some of the problems as quickies.

5. Jerry paid 30 cents for $\frac{2}{3}$ of a pie. At that rate, what was the whole pie worth?

6. Jill sold $\frac{3}{4}$ dozen flowers for 75 cents. How much were the flowers per dozen?

7. Bob sold 6 eggs for 25 cents. How much was that per dozen?

8. Barbara bought a 4-ounce chocolate bar for 20 cents. What part of a pound did she buy? How much was she paying per pound?

9. If a half bushel of peaches costs $1.25, how much is a bushel of peaches worth at this rate?

10. Don paid 8 cents for a 2-ounce peanut bar. What part of a pound did he buy? How much per pound did he pay?

11. If 12 ounces of hot dogs cost 45 cents, how much does a pound of the hot dogs cost?

12. Sam picked 6 boxes of strawberries in 40 minutes. What part of an hour is this? At this rate, how many boxes can Sam pick in an hour?

13. Sally paid $1.50 for a remnant of cloth, $\frac{3}{4}$ yard long, to cover a sofa cushion. At that rate, how much a yard was the cloth?

14. Sixty is $\frac{5}{8}$ of what number? $60 \div \frac{5}{8} = 60 \times \frac{8}{5} = ?$

Copy each of the following examples and find the missing number.

	a	*b*	*c*
15.	8 is $\frac{1}{4}$ of ?	6 is $\frac{2}{3}$ of ?	12 is $\frac{3}{4}$ of ?
16.	35 is $\frac{1}{2}$ of ?	60 is $\frac{5}{9}$ of ?	240 is $\frac{3}{5}$ of ?

Buying to Save

Wise buying is one good way to save money. Often, things you need are put on sale for considerably lower prices. You may also be able to save by buying larger amounts of things at one time. Can you think of times when it does not pay to buy things even if they cost less?

1. Jean wanted to buy 2 ball point pens, one for herself and one for Tony's birthday. She waited until these pens were advertised at a "one cent sale." One pen cost $1.00; you could buy a second pen for just one cent more, or $1.01 in all. How much did Jean save by waiting until the sale to buy the pens?

2. At a "one cent sale," 1 tube of tooth paste cost 29 cents and 2 tubes cost 30 cents. Mrs. Lane bought 4 tubes for 60 cents. How much did she save?

3. Mr. Lane saw a special sale of 2 gallons of oil for $1.89 advertised at a filling station. The regular price of this oil was 30 cents a quart. How much would Mr. Lane save by buying 2 gallons of oil for his car at the special price instead of at the regular quart price?

4. Sally needed 4 balls of wool yarn for her knitting. At a "Community Day" sale, the price of yarn was reduced from 65 cents a ball to 57 cents a ball. How much did Sally save by buying her yarn on sale?

5. The regular price of evaporated milk in a food store was 4 cans for 59 cents. At the sale, 8 cans were sold for $1. Find the saving on 8 cans.

6. Canned peaches had been 29 cents a can. At the sale, the price was 4 cans for $1. How much would Mrs. Lane save by buying 8 cans at the sale?

7. At a February sale, winter clothes were offered at one third off. How much would Sam save on a suit that had originally been priced at $22.50. How much would the suit cost?

8. Sam saw some work shirts marked $2.98 each or 2 for $5.75. How much would he save by buying two shirts at once instead of at different times?

9. Blouses were on sale at half price. How much would Sally's mother save if she bought Sally two blouses, one blouse originally priced at $2.30 and the other at $1.96?

10. Socks costing 50 cents a pair were on sale at 3 pairs for $1.39. How much would Jill save by buying 3 pairs of socks at the sale?

11. Sally saw that a 6-ounce can of orange juice cost 15 cents. A large 24-ounce can cost 55 cents. How much would Sally save by buying 24 ounces of juice in the large can instead of in the smaller cans?

12. Dish towels regularly priced at 33 cents sold 2 for 50 cents. How much would Mrs. Gray save by buying 6 towels on sale?

13. When Mr. Gray painted his house, he found that paint in quart cans cost $1.16 a quart. In 5-gallon cans it cost $19.70 for 5 gallons. How much would Mr. Gray save if he bought a 5-gallon can of paint instead of the same amount of paint in quart cans?

14. At the store, apples were selling for 8 cents a pound. Sally's mother could buy a half-bushel basket of the same sort of apples for $1.50. A bushel of apples weighs 48 pounds. How much cheaper would it be to buy the basket of apples than to buy these apples by the pound?

Page 294 provides enrichment material which can be used after this page.

Using Time To Measure Distance

Sometimes, instead of measuring distance by miles, you measure it by the time needed to travel it.

1. Shirley lives near a large city. Her father drives in to the city to work. It takes him $\frac{3}{4}$ hour to make the drive. When should he leave home to be at his office by 8:30? If he leaves his office at 4:35, when should he get home?

2. An airline says that the flight from New York to Detroit takes 3 hr. 12 min., and the flight from New York to Milwaukee takes 5 hr. 5 min. How much less time does the flight to Detroit take?

3. Jill went by train to visit her aunt in the city. Jill's train left at 11:20 a.m. and arrived at 1:45 p.m. How long did the trip take?

4. While the Lanes were driving in their car, Tony noticed that they had driven 12 miles in 15 minutes on an open road. Fifteen minutes is $\frac{1}{4}$ of an hour, so in one hour they would go 4×12 miles. How many miles per hour were they traveling?

5. Later that day, Tony timed his father again. The Lane car went 30 miles in 40 minutes. What part of an hour is 40 minutes? How many miles an hour were they traveling?

6. At 30 miles an hour, find how long it will take a car to go 24 miles. The car goes 30 miles in 60 min., so it goes $\frac{30}{60}$, or $\frac{1}{2}$ mi. in 1 min. To go 24 mi. will take $24 \div \frac{1}{2}$, or ? min.

7. Find how long it will take a car to go 24 miles at the rate of 40 miles an hour. $24 \div \frac{2}{3} = ?$

8. How many minutes does it take to go 24 miles at 45 miles an hour? At 50 miles an hour?

How Much Time Has Passed?

1. Sam got on the school bus this morning at 7:38. The bus got back to Sam's house this afternoon at 4:11. How many hours and minutes is it from 7:38 to noon? How many hours and minutes from noon to 4:11 p.m.? Then how long was Sam away from home today?

2. Ann leaves home to walk to school at 8:45 a.m. She gets home for lunch at 12:10 p.m. How long has she been away from home?

3. In the afternoon, Ann leaves for school at 12:55. She gets home at 3:25. How long is she away from home in the afternoon?

4. Sally went to bed last night at 8:45. She got up this morning at 7:15. Subtract 8:45 from 12:00 (midnight), and add 7 hours and 15 minutes. How long was Sally in bed?

5. Jerry is supposed to get 10 hours' sleep every night. If he is to get up at 7:10 a.m., when should he go to bed?

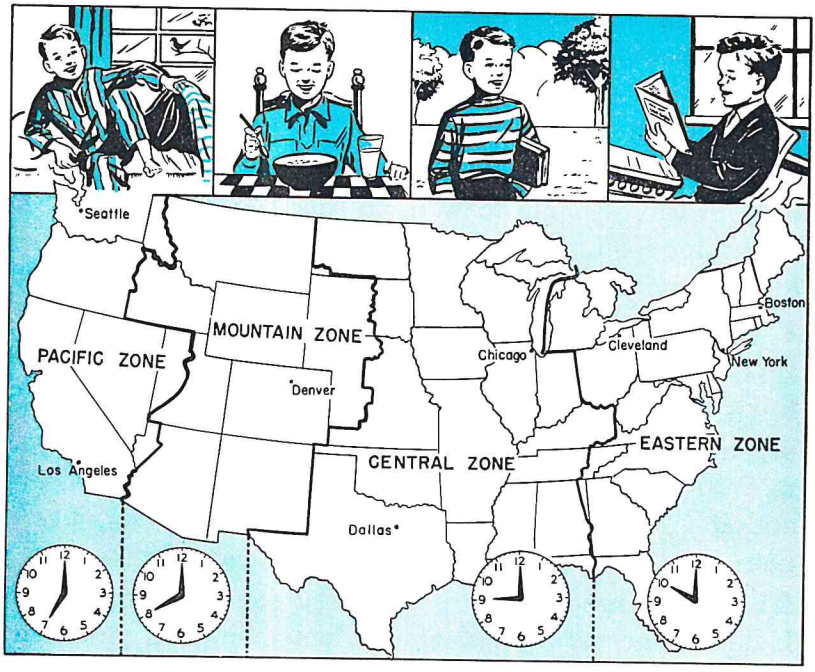
6. Jean was drawing a poster for a school sale. She started to work on the poster at 11:35 one Saturday morning and finished it at 2:47 that afternoon. How long did she work on it?

7. It is 3:20, and Joe is reading an exciting story. He has a trumpet lesson at 4:45. If it takes him half an hour to get to his lesson, how much longer can he read?

8. After a heavy snow one night, the buses in Bill's city could not run. There was no bus service from 6:45 a.m. to 3:30 p.m. How long was the city without buses?

9. One Saturday, Don worked from 8:15 a.m. to 11:45 a.m. and from 12:30 p.m. to 4:30 p.m. He was paid 40 cents an hour. How much did Don earn?

Time Zones



Our country is so big that the sun cannot rise over all of it at the same time. When the sun is just coming up in New Jersey, sunrise is an hour away in Illinois. It is still dark in Denver, and in Seattle the sun will not rise for three hours.

If you have ever taken a long train, plane, or automobile trip east or west, you have set your watch an hour faster or slower at certain places. The map shows you where. Study the map carefully. Then see if you can do the following quickies.

1. When it is 1:30 in Cleveland, what time is it in Chicago?

2. Polly lives in Los Angeles, California. This morning she got up at 7:10. What time was it in New York, where her cousin Margie lives?

3. It is easy to remember whether time in the West is earlier or later than time in the East. Just remember that *the earth turns toward the east.* Therefore the sun rises first in the Eastern Zone, and time there must be ahead of time in the other zones. When it is 7 o'clock in Boston, it is 6 o'clock Central Time. What time is it by Mountain Time? By Pacific Time?

4. Lois is flying from New York to visit her aunt in Seattle. She left New York at 8:15 a.m. What time was it in Seattle then? If Lois resets her watch when she reaches Seattle, should she set the watch forward or back?

5. Mr. Lane is in Cleveland. He wants to telephone a business friend in Dallas at 3:15 p.m. Dallas time. What time will this be in Cleveland? If he calls a Denver firm at 5:00 Cleveland time, what time will this be in Denver?

6. A football game is to start in Los Angeles at 2:15 p.m. Andy lives in Chicago. He wants to watch the game on television. When should Andy tune in?

7. A baseball game will start in Boston at 1:30 p.m. Marian lives in Denver. When should she turn on her radio to hear the game?

8. Mr. Morton, in Dallas, wants to telephone his son who lives in Seattle. He knows that his son will be home at 7:00 p.m. Seattle time. When should Mr. Morton call?

9. On an automobile trip, Tony's watch read 3:20 when they crossed from the Central Zone to the Eastern Zone. To what time should Tony set his watch?

Pages 295 and 296 provide enrichment material which can be used after this page.

Can You Compute?

Diagnostic Check Test 3A

This test will show you how well you have learned to work with whole numbers, money numbers, fractions, and measures. Copy each example carefully. Check all your answers.

Do what the signs tell you to do.

	a	*b*	*c*	*d*
1.	$\frac{3}{4} - \frac{2}{3}$	$6 \div \frac{2}{3}$	$\frac{1}{2} + \frac{3}{4}$	$3\frac{2}{3} \times 2\frac{3}{4}$
2.	$5 - 1\frac{5}{8}$	$\$2.40 \div 1\frac{1}{2}$	$3 \times 4\frac{1}{2}$	$12\frac{1}{2} \div 7\frac{1}{2}$

Add.

3.	$6\frac{1}{2}$	6 lb. 7 oz.	8073	\$268.09
	5	3 lb. 11 oz.	968	76.74
	$3\frac{7}{8}$	4 lb. 9 oz.	5298	8.80
	$2\frac{3}{4}$	2 lb. 15 oz.	16187	54.93

Subtract.

4.	\$20.00	12 hr.	$8\frac{1}{2}$	5203
	8.96	7 hr. 19 min.	$7\frac{2}{3}$	4917
5.	$20\frac{1}{8}$	9 ft. 7 in.	64365	\$149.50
	$13\frac{3}{4}$	3 ft. 8 in.	19285	68.86

Multiply.

6.	690	875	\$9.80	\$31.57
	80	67	35	50
7.	493	706	45	\$3.20
	149	403	$8\frac{1}{5}$	$2\frac{3}{8}$

Divide.

8.	$90\overline{)7200}$	$46\overline{)13708}$	$29\overline{)8903}$	$80\overline{)12040}$
9.	$126\overline{)10836}$	$37\overline{)20800}$	$58\overline{)\$20.30}$	$25\overline{)\$187.75}$

Do You Understand Numbers?

Diagnostic Check Test 3B

This test will show you how much you know about the meaning and relationships of numbers.

1. In the number 3482, what value has the 8?

2. How many thousands are there in 153260?

3. What is the perimeter of a square each side of which is $8\frac{3}{4}$ feet long?

4. What is the area of a rectangle $12\frac{1}{2}$ inches long and 8 inches wide?

5. How many acres are there in a rectangular field 16 rods by 40 rods?

6. Write a multiplication example you can use to check the division example $15 \div 1\frac{2}{3} = 9$.

7. Write the addition example you use to check the subtraction example $\frac{3}{4} - \frac{2}{3} = \frac{1}{12}$.

8. Eighteen is what fractional part of 24?

9. Twenty-four is $\frac{3}{8}$ of what number?

10. What number is $\frac{5}{6}$ of 30?

11. How much larger is $7\frac{1}{4}$ than $4\frac{7}{8}$?

12. Change 5 ft. 9 in. to feet.

13. Change 90 minutes to hours.

14. One hundred is how many times as large as 25?

15. Is 651 nearer 600 or 700?

16. Is $8\frac{3}{8}$ nearer 8 or 9?

17. Arrange $\frac{1}{8}$, $\frac{1}{2}$, $\frac{1}{7}$, and $\frac{1}{5}$ in the order of their value, the smallest first.

18. In the series 1, 2, 4, 8, 16, ?, 64, what is the missing number?

Can You Use Arithmetic?

Diagnostic Check Test 3C

This test will help you find out how well you can use whole numbers, money numbers, measures, and fractions in solving problems. You may be able to work some of the problems as quickies. After you have worked all the problems, read them over again to be sure that your answers are reasonable.

1. Tony is reading a road map. The scale is 1 in. = 12 mi. On the map it is $3\frac{3}{4}$ in. between two towns. How many miles apart are the towns?

2. One of Sue's recipes calls for $1\frac{3}{4}$ cups of sugar. Sue wants to make half this quantity. How much sugar should she use?

3. Judy is 8 years old. Her mother is 32 years old. How many times as old as Judy is her mother? In 4 years from now, how many times as old as Judy will her mother be?

4. Sue and her mother made 9 pounds of candy for Christmas presents. They put the candy in $1\frac{1}{2}$-pound boxes. How many boxes did they have?

5. A recipe that will make 18 cookies calls for $1\frac{3}{4}$ cups of flour. Sue wants to make 36 cookies. How many cups of flour should Sue use?

6. Bob bought an incubator to hatch chicks. He put 150 eggs in the incubator. Only 120 of the eggs hatched. What fractional part of the eggs hatched? What part of the eggs did not hatch?

7. If a 2-ounce bar of chocolate costs 10 cents, how much would a pound of this chocolate cost?

8. Mrs. Lane wants to buy a meat roast for Sunday dinner. A piece of meat weighing $2\frac{1}{2}$ pounds costs \$1.80. At this rate, how much would a $7\frac{1}{2}$-pound roast of the meat cost? (There is more than one way to work this problem. See if you can find a short way.)

9. Nora's new book has 240 pages. Nora has read 72 pages in $1\frac{1}{4}$ hours. At this rate, how long will it take her to read the rest of the book?

10. Bill weighs 96 pounds, Tony weighs 108 pounds, and Jerry weighs 89 pounds. Is Bill's weight more or less than the average weight of the three boys? How many pounds more or less?

11. Don worked from 8:30 to 11:00 one Saturday morning. At 30 cents an hour, how much did he earn?

12. Sam is going to make a pen 8 ft. by 10 ft. for his pet rabbits. How many yards of fencing will he need?

13. At 10 cents a square foot, how much would it cost to clean a rug 9 feet wide and 12 feet long?

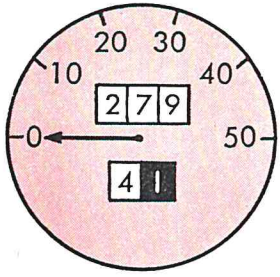
14. The car in which Sam is riding went 20 miles in 30 minutes. How many miles an hour was it going?

15. If a car is going 45 miles an hour, how many minutes will it take to go 12 miles?

16. Bob's family drove to Elwood. When they started, the speedometer read 19876 miles. When they reached Elwood, it read 19953. They drove home a different way. The speedometer read 20022 when they got home. How many miles shorter was the way they came home?

17. Ann's town has parking meters. The charge is 1 cent for 12 minutes and 5 cents for an hour. Ann's mother parked at 3:25 p.m. She put a nickel and two pennies in the meter. When was her parking time used up?

Another Kind of Fractions

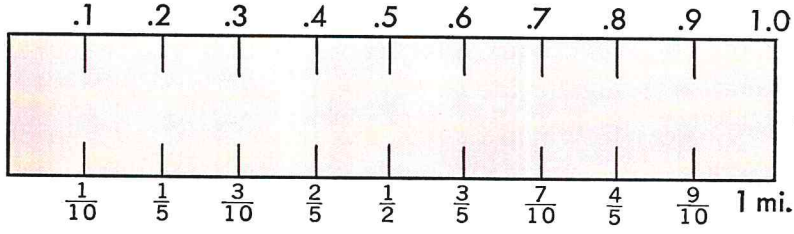


1. This is a picture of the new speedometer Bill bought for his bicycle. The clerk said it had two mileage records—total to 1000 miles, and trip to 10 miles.

The total record will show 999 miles and then go to 000, just 1,000 miles. The trip record will show 9.9 (9 and 9 tenths) miles, and then go to 0.0, just 10.0 miles.

The right-hand figure of the trip record means tenths of a mile. It is a decimal way of writing tenths. So 4.1 means $4\frac{1}{10}$; 4.3 means $4\frac{3}{10}$. Write the decimal 9.9 as a mixed number. The decimal 1.7.

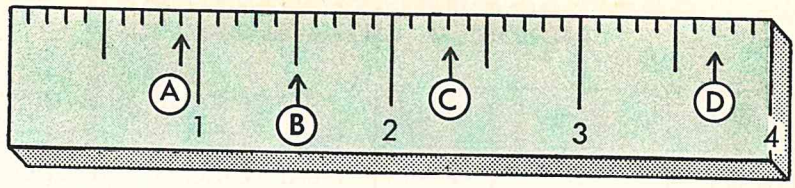
Fractions with a denominator of 10 can be written as decimals.



The diagram above shows a scale drawing of 1 mile divided into tenths. The tenths are written above the line in the decimal way and under the line as common fractions.

Use the diagram to help you change the following fractions to decimals and the decimals to fractions in lowest terms.

	a	b	c	d	e
2.	$\frac{7}{10} = ?$	$\frac{1}{10} = ?$	$\frac{2}{5} = ?$	$1\frac{1}{2} = ?$	$3\frac{3}{5} = ?$
3.	$.9 = ?$	$.2 = ?$	$2.8 = ?$	$4.9 = ?$	$7.4 = ?$



4. Dick has a ruler that shows inches divided into tenths. Arrow A shows .9 of an inch. Arrow B shows 1.5 inches. How many inches does Arrow C show? How many inches are shown by Arrow D?

5. Dick says he likes his decimal ruler because it is easier to add and subtract with decimals than with fractions. One day, he wanted to find out how much would be left of a board 10.5 in. long when he cut off a piece 4.6 in. long. Subtract with decimals and then with fractions (4.6 in. is nearly the same as $4\frac{5}{8}$ in.). With decimals, the remainder is ? in. How much is the remainder with fractions?

10.5	$10\frac{1}{2} = 9\frac{12}{8}$
4.6	$4\frac{5}{8} = 4\frac{5}{8}$
5.9	$5\frac{7}{8}$

Add.

	a		b		c	
6.	3.5	$3\frac{1}{2}$	8.4	$8\frac{2}{5}$	16.2	$16\frac{1}{5}$
	4.9	$4\frac{9}{10}$	19.5	$19\frac{1}{2}$	.9	$\frac{9}{10}$

Subtract.

7.	16.1	$16\frac{1}{10}$	2.7	$2\frac{7}{10}$	20.5	$20\frac{1}{2}$
	5.8	$5\frac{4}{5}$	1.6	$1\frac{3}{5}$	9.8	$9\frac{4}{5}$

8. If Sam rides his bicycle one way to the lake, the trip meter on his speedometer measures the distance as 4.8 miles. If he rides another way, the meter measures 5.5 miles. How much shorter is the shorter way?

Using a Timetable

Miles	Stations	Daily
		P.M.
0.0	Chicago	1:00
116.6	Logansport	3:15
139.3	Kokomo	3:54
161.0	Elwood	4:21
175.6	Anderson	4:45
197.4	New Castle	5:23
224.2	Richmond	6:04

Here is part of a timetable. It shows distances from Chicago to Richmond, Indiana, and the time the train is due to reach each station. Fractions of a mile are shown in decimal tenths. See if you can use this timetable.

1. It is 116.6 miles from Chicago to Logansport. How far is it from Chicago to Kokomo?

2. To find the distance from Logansport to Kokomo, subtract 116.6 from 139.3. How many miles is this?

3. Find the distance from Logansport to Elwood.

4. What is the distance between Anderson and Richmond?

5. How long does it take to go from Logansport to Elwood? (Subtract 3:15—that is, 3 hr. 15 min.—from 4:21.)

6. How long does it take to go from Kokomo to New Castle?

7. One snowy day, the train reached Logansport at 4:09. How many minutes late was it?

8. If the train is 1 hr. 20 min. late, when will it arrive in Anderson?

9. When the fare was 3¢ a mile, what was the cost of a ticket from Logansport to New Castle? (In the distance, count a part of a mile as another whole mile.)

10. To the nearest hour, how long does it take the train to go from Chicago to Richmond? What is the distance to the nearest mile? Then approximately how many miles per hour does the train average on its trip?

Adding Decimal Tenths

Write the fractions in each example as decimal tenths, then add. So, in Example **1a**, you first change $\frac{1}{2}$ to .5 and $\frac{4}{5}$ to .8, then add .5 and .8.

	a	b	c	d	e
1.	$\frac{1}{2}$ $\frac{4}{5}$	$\frac{2}{5}$ $\frac{3}{10}$	$\frac{7}{10}$ $2\frac{1}{2}$	$8\frac{4}{5}$ $5\frac{9}{10}$	$9\frac{3}{10}$ $8\frac{1}{2}$
2.	$\frac{7}{10}$ $4\frac{1}{10}$	$8\frac{3}{5}$ $7\frac{1}{10}$	$11\frac{1}{5}$ $6\frac{1}{10}$	$7\frac{1}{2}$ $10\frac{3}{5}$	$2\frac{9}{10}$ $\frac{2}{5}$
3.	$\frac{3}{10}$ $\frac{1}{5}$ $\frac{1}{2}$	$2\frac{7}{10}$ $1\frac{3}{5}$ $3\frac{1}{10}$	$5\frac{1}{2}$ $3\frac{9}{10}$ $2\frac{2}{5}$	$4\frac{4}{5}$ $1\frac{1}{2}$ $8\frac{7}{10}$	$10\frac{1}{10}$ $4\frac{1}{5}$ $13\frac{1}{2}$

	a	b
4.	$2\frac{3}{5} + 3\frac{1}{2} + 4$	$1\frac{4}{5} + \frac{9}{10} + 2\frac{3}{5}$
5.	$3\frac{4}{5} + 18\frac{1}{10} + 1\frac{1}{2} + 6$	$1\frac{9}{10} + 8\frac{4}{5} + \frac{1}{2} + 3\frac{2}{5}$

Subtracting Decimal Tenths

Write the fractions as decimal tenths and subtract. Check your work by addition.

	a	b	c	d	e
1.	$\frac{9}{10}$ $\frac{2}{5}$	$\frac{4}{5}$ $\frac{1}{2}$	$2\frac{7}{10}$ $1\frac{1}{5}$	$4\frac{4}{5}$ $2\frac{1}{10}$	$8\frac{1}{2}$ $8\frac{1}{5}$
2.	$5\frac{1}{5}$ $1\frac{1}{2}$	$7\frac{1}{10}$ $6\frac{2}{5}$	$4\frac{1}{2}$ $3\frac{3}{5}$	$5\frac{3}{10}$ $2\frac{3}{5}$	$4\frac{7}{10}$ $1\frac{4}{5}$
3.	6 $2\frac{1}{5}$	10 $3\frac{7}{10}$	$8\frac{9}{10}$ $5\frac{1}{2}$	$14\frac{1}{5}$ $9\frac{1}{10}$	30 $27\frac{2}{5}$
4.	$17\frac{1}{5}$ $15\frac{3}{10}$	$41\frac{1}{10}$ $12\frac{1}{5}$	$11\frac{1}{2}$ $8\frac{3}{10}$	$9\frac{3}{5}$ $\frac{9}{10}$	$25\frac{3}{10}$ $7\frac{1}{2}$

Using Decimal Tenths

These problems show some of the ways you can use decimal tenths. Before working each problem, decide whether to add or subtract. Be sure your answers are reasonable.

1. Last year, it took Peggy 10.6 seconds to run the 50-yard dash. This year, she can run it in 9.8 seconds. How much faster can she run it this year?

2. Bill rode his bicycle 5.8 miles on Friday and 14.5 miles on Saturday. How much farther did he ride on Saturday?

3. Sam measured the ice on the lake. Last night the ice was 2.9 inches thick. This morning it is 3.6 inches thick. How much thicker did the ice get during the night?

4. Jean has the flu, and the doctor says her temperature is 2.5° above normal. Normal temperature is 98.6°. What is Jean's temperature?

5. Mr. Lane is also in bed with the flu. This morning his temperature was 101.4°. Does he or Jean have the higher temperature? How much higher?

6. By railroad, the distance from Rockwell to Newton is 68.6 mi., and from Newton on to Sunbridge is 53.8 mi. How far is it from Rockwell to Sunbridge?

7. On Monday morning, the speedometer on Mr. Gray's truck read 19806.3. On Saturday night, it read 20091.0. How many miles had the truck been driven that week?

8. The Lanes drove 39.2 miles going to visit a relative. They came home by a shorter route, only 34.8 miles. How far did they drive in all? How much shorter was the return route than the way they went?

Page 297 provides enrichment material which can be used after this page.

Can You Copy Numbers Correctly?

Can you copy numbers without making mistakes?

Do you write figures clearly, so you are sure what each figure is?

Do you write each figure in the right place, so you know which figures are ones, tens, hundreds, thousands?

Do you keep your columns straight for adding, so you don't get over into the wrong column?

Copy these examples carefully and correctly.

Copy in columns, add, and check.

1. $538 + 66 + 2204 + 3 + 674 + 40 + 498$
2. $9876 + 177 + 12092 + 25 + 5753 + 893$
3. $25146 + 7614 + 56879 + 80 + 633 + 7816$
4. $\$7.50 + \$19.25 + \$.95 + \$4.27 + \$.61 + \$28$
5. $\$323.07 + \$49.49 + \$627 + \$9.88 + \$56.79$

Copy, subtract, and check.

	a	*b*	*c*
6.	$102 - 9$	$215 - 87$	$1046 - 98$
7.	$1658 - 709$	$2056 - 587$	$14103 - 4926$
8.	$\$1.75 - 99¢$	$\$2 - 73¢$	$\$13.50 - \$7.60$
9.	$\$10 - \$9.07$	$\$73.61 - \$8.56$	$\$150 - \$54.85$

Copy, multiply, and check.

10.	46×69	80×167	25×408
11.	90×806	67×1280	137×5609
12.	$94 \times \$7.50$	$25 \times \$17.69$	$18 \times \$348.59$

Copy, divide, and check.

13.	$651 \div 93$	$737 \div 24$	$6630 \div 85$
14.	$35183 \div 40$	$9454 \div 326$	$12642 \div 147$
15.	$\$7.02 \div 78$	$\$48.84 \div 66$	$\$873.60 \div 560$

Understanding Decimal Hundredths

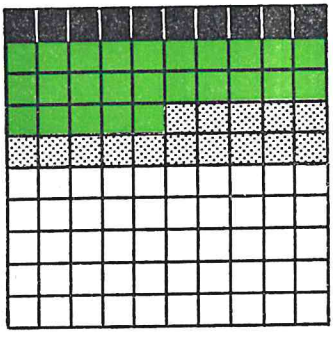
1. Bill read in the paper that in a ski-jumping contest, the winning jump was 283.42 feet. His father told him that 283.42 meant $283\frac{42}{100}$. The length of the jump had been measured more closely than to the nearest foot, or the nearest inch, or the nearest tenth of a foot. It was measured in *hundredths* of a foot.

Bill read, too, that the winning time for a bobsled race was 5 min. 45.54 sec. Write 45.54 as a mixed number.

2. Fractions with denominators of 100 are written as decimals with two figures after the decimal point. For example, $\frac{27}{100}$ is written .27; $\frac{9}{100}$ is written .09; $18\frac{31}{100}$ is written 18.31.

Write the following figures as decimals.

a	b	c	d	e	f
$\frac{53}{100}$	$\frac{7}{100}$	$5\frac{1}{100}$	$6\frac{13}{100}$	$99\frac{99}{100}$	$3\frac{29}{100}$



3. In our money system, cents are hundredths. Each cent is a hundredth part of a dollar. Think of the square at the left as one dollar. Then each small square is $\frac{1}{100}$ of a dollar, or \$.01.

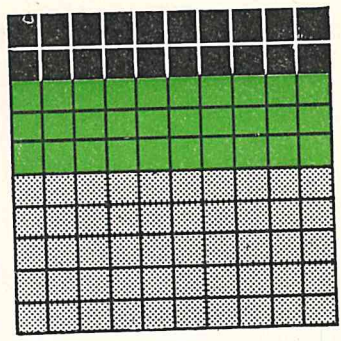
a. How many small squares are black? They show \$.10, or one dime, or one tenth of a dollar.

b. How many small squares are in color? They show \$.25, or one quarter of a dollar.

c. How many of the small squares are shaded? They show \$.15.

d. How many small squares in all have been marked (black, colored, shaded)? What part of a dollar are they?

4. a. In the square at the right, how many small squares are black? They show .20 or .2 or $\frac{1}{5}$ of the whole square.



b. In this square, how many small squares are colored? They show .30 or .3 or $\frac{3}{10}$ of the square.

c. How many squares have been shaded? They show .50 or .5 or $\frac{1}{2}$ of the square.

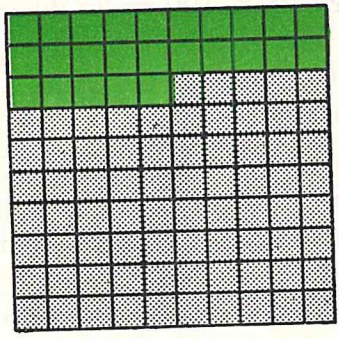
d. You can add these parts of the square in three ways to show that the whole square has been marked (black, colored, or shaded):

$.20 + .30 + .50 = 1.00$

$.2 + .3 + .5 = 1.0$

$\frac{1}{5} + \frac{3}{10} + \frac{1}{2} = \frac{2}{10} + \frac{3}{10} + \frac{5}{10} = \frac{10}{10} = 1$

You can see that: $1.00 = 1.0 = 1$



5. a. In the square at the left, $\frac{1}{4}$ of the small squares are in color. How many small squares are colored? $\frac{1}{4} = .25$.

b. In this square, $\frac{3}{4}$ of the small squares have been shaded.

$\frac{3}{4} = .75$.

c. Now add the parts that have been marked:

$\frac{1}{4} + \frac{3}{4} = .25 + .75 = ?$

Two figures after the decimal point show hundredths.

Write the following fractions as decimal hundredths.

	a	b	c	d
6.	$\frac{17}{100}$	$\frac{5}{100}$	$\frac{2}{100}$	$\frac{45}{100}$
7.	$\frac{1}{4} = \frac{25}{100} = ?$	$\frac{3}{4} = \frac{?}{100} = ?$	$\frac{1}{5} = \frac{?}{100} = ?$	$\frac{7}{10} = \frac{?}{100} = ?$

Place Value in Decimals

Thousands	Hundreds	Tens	Ones		Tenths	Hundredths	Thousandths
3	7	2	4	.	6	5	8

1. You know that in our system of writing numbers, each figure in a number has a place value. Look at the number in the box. The 3 has a value of 3000. What value does the 7 have? The 2? The 4?

Going on to the right of the decimal point, you know that the 6 has a value of $\frac{6}{10}$, and the 5 has a value of $\frac{5}{100}$. The 8 has a value of $\frac{8}{1000}$. Starting at the decimal point and going *left*, you say, "Ones, tens, hundreds, thousands." Starting at the decimal point and going *right*, the first word you say is "Tenths." What are the next two words you say?

2. $10 \times 1 = 10$. $10 \times 10 = ?$ $10 \times 100 = ?$ When a figure is moved one place to the left, its value becomes 10 times as much (is multiplied by 10). Think of the figure 3. 3 means 3 ones. What does 30 mean? 300?

3. When a figure is moved one place to the *right* in our number system, its value is only one tenth as much. Think of the numbers 300, 30, and 3. 30 is what fraction of 300? 3 is what fraction of 30?

In the same way, think of .3, .03, and .003. One tenth of .3 ($\frac{3}{10}$) is .03 (because $\frac{1}{10} \times \frac{3}{10} = \frac{3}{100}$). One tenth of .03 is .003 ($\frac{1}{10} \times \frac{3}{100} = ?$)

Since *our whole number system* is built on tens, it is called a decimal system. "Decimal" means "based on the number 10." If you understand the decimal system, you can handle tenths, hundredths, and thousandths just like any other numbers.

4. Is .06 larger or smaller than .3?

5. Which is smaller, .7 or 1.0?

6. Which is larger, .85 or .9?

Look at each pair of numbers below. On your paper, write the larger number of each pair.

	a	b	c	d
7.	.6, .4	.09, .2	.006, .02	3.3, .33
8.	.5, .49	1.0, 10	6.3, 6.29	8, .8
9.	23, 2.3	.875, .9	.47, .444	6.2, 6.08

10. Copy this series and fill in the missing decimals:
.3, .6, .9, ?, 1.5, 1.8, ?, 2.4

11. What is the smallest decimal you can write with the figures 3, 5, and 2? With 7, 0, and 4?

On your paper, write the number that is *ten times as large* as each number below.

	a	b	c	d	e	f
12.	5	60	125	.05	.001	.062

In each of these examples, which direction in the number system did the figures move?

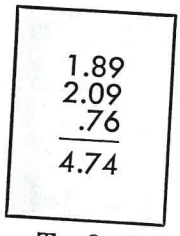
On your paper, write the number *one tenth as large* as each number below. Which direction in the number system do the figures move?

13. 10 500 8000 .6 .06 1.0

You have already computed with decimal money numbers. The examples below are quickies.

	a	b	c
14.	$\$2.35 + \$.50$	$\$2.00 - \$.75$	$\$.48 + \$.52$
15.	$5 \times \$1.05$	$3 \times \$.50$	$9 \times \$3.07$
16.	$\$1.50 \div 6$	$\$27.30 \div 3$	$\$1.89 \div 9$
17.	$4 \times \$7.25$	$\$4.30 + \$.65$	$\$2.48 \div 8$

Adding Decimals



1. During a three-day storm, Don saw in the paper that the rainfall for the first day was 1.89 inches, for the second day 2.09 inches, and for the third day 0.76 inches. One inch of rainfall means enough rain to cover a flat surface to the depth of one inch.

To find the total rainfall for the three days, add. Add these numbers just as you add dollars and cents. There are *two decimal places* in the answer. What was the total rainfall?

Copy and add these decimal tenths.

	a	b	c	d	e	f
2.	.7	2.6	6.3	35.2	18.0	63.4
	.9	4.7	2.8	60.5	9.6	8.6
	.5	1.8	5.9	13.8	7.4	15.2

Copy and add these decimal hundredths.

3.	.67	6.05	9.34	12.02	27.79	32.71
	.39	3.84	.68	3.59	6.00	60.94
	.75	.87	3.80	.69	48.21	8.68

Copy and add these decimal thousandths.

4.	.341	2.506	7.195	3.964	4.169	3.566
	.750	1.685	3.408	.076	3.285	6.000
	.667	3.472	1.629	2.739	3.516	5.735

Copy in columns and add. Be sure the decimal points are in a column, so that tenths will be under tenths, hundredths under hundredths, etc., for adding.

	a	b
5.	4.7, 6.9, 17.3, 20.6	2.65, 10.37, 6.28, 4.30
6.	5.00, 7.06, 12.47, 6.37	3.186, 5.209, .760, 7.345

Subtracting Decimals

1. One day, Bill was reading about the Indianapolis automobile race. The average speed of the winner of that year's race was 128.922 m.p.h. (miles per hour). Bill wondered how much faster than this an automobile had ever been driven.

He found that the fastest an automobile had been driven at that time was 394.196 m.p.h. To find the difference between this speed and that of the winner in the Indianapolis race, subtract as with other decimals.

```
394.196
128.922
-------
265.274
```

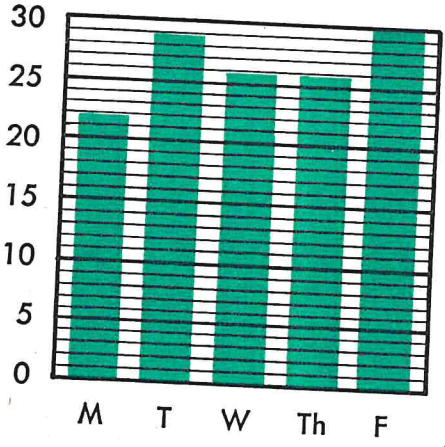
Look at the work in the box. How many decimal places are there in the answer? Write it as a mixed number.

Copy, subtract, and check.

	a	b	c	d	e	f
2.	14.3 − 9.6	37.9 − 18.5	93.5 − 59.7	81.4 − 26.4	60.0 − 54.9	73.6 − 43.7
3.	7.26 − 2.80	8.78 − 7.98	26.03 − 9.45	92.50 − 27.12	56.67 − 18.67	70.37 − 20.25
4.	2.045 − .678	7.730 − 6.087	64.316 − 38.626	31.208 − 3.409	0.924 − 0.775	12.612 − 5.782
5.	434.1 − 279.3	7.460 − 3.606	80.37 − 45.60	133.54 − 68.06	9.301 − 8.506	106.3 − 85.9
6.	15.375 − 9.874	83.26 − 83.17	94.72 − 18.76	726.0 − 695.4	52.00 − 47.38	17.302 − 4.430

	a	b	c
7.	325.4 − 86.5	98.06 − 18.60	16.004 − 7.266
8.	24.500 − 9.481	345.7 − 256.7	134.30 − 89.36
9.	17.554 − 16.893	2156.4 − 187.7	14.31 − 13.79

Using Graphs



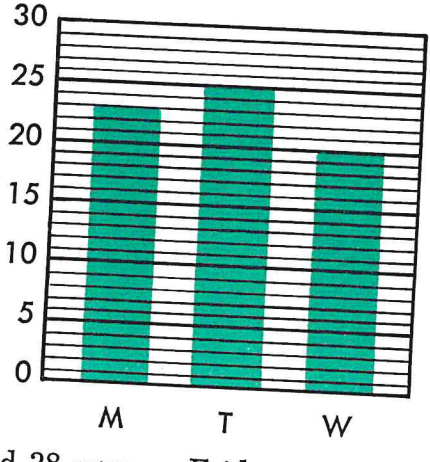
1. Bill likes to keep a record of the eggs laid by his hens. He uses a bar graph to show how many eggs he gets each day. Look at the graph for five days of week before last. See if you can answer these questions.

a. On what day were the most eggs laid?

b. On what day were the fewest eggs laid?

c. On what day was the number of eggs the same as that of the day before? On what day did the number of eggs drop from the number the day before?

2. Here is Bob's egg record for the first three days of last week.



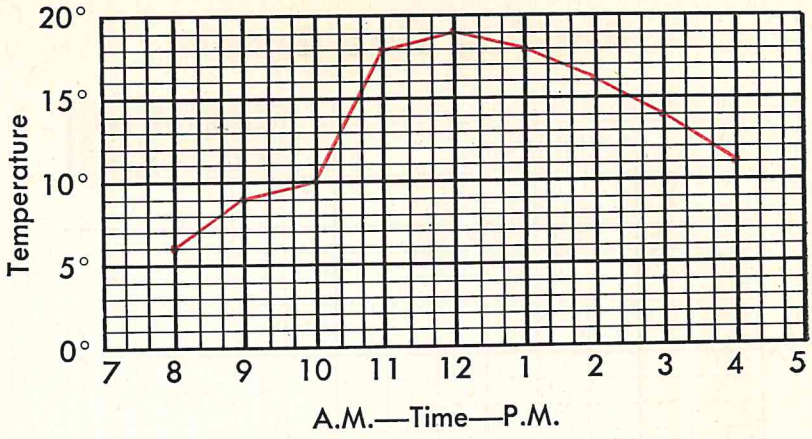
a. How many more eggs did Bob get on Tuesday than on Monday?

b. How many fewer eggs did he get on Wednesday than on Tuesday?

c. On ruled paper, copy Bob's graph. Finish your graph to show that Bob got 24 eggs on Thursday and 28 eggs on Friday.

d. How many eggs did Bob get during all five days?

e. What was the average number of eggs per day?



3. Tom sometimes keeps weather records. One winter day, he read the temperature every hour from 8 a.m. to 4 p.m. To show the changing temperature, he made a line graph, as shown above.

a. What was the temperature at 8 a.m.? At 10 a.m.? At noon? At 2 p.m.? At 4 p.m.?

b. Between which two hours did the temperature rise most rapidly?

c. At what hour did the temperature start to fall?

d. At which two hours was the temperature the same?

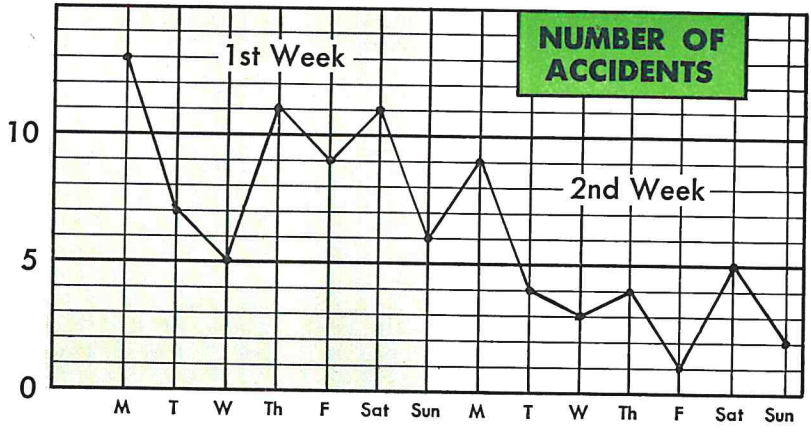
e. How many more degrees did the temperature rise than it fell?

Bar graphs are a good way to *compare numbers.* They show quickly which numbers are larger and which are smaller and how much larger or smaller they are.

Line graphs are a good way to show *rate of change.* For instance, in the graph at the top of the page, the steepest place in the line shows when the temperature rose most rapidly. You can see at a glance when the temperature started to go down.

Pages 298 and 299 provide enrichment material which may be used after this page.

Another Line Graph



Tom's class is studying safety. A committee kept a two-weeks' record of the number of accidents reported by the pupils, no matter how slight. Then they made the graph shown above.

1. How many accidents were reported the first Monday? The second Monday?

2. How many more accidents were there on Wednesday of the first week than Wednesday of the second?

3. In the first week, how many more accidents were there on Thursday than on Wednesday?

4. On what two days of the first week were the numbers of accidents the same?

5. On what two days of the second week were the numbers of accidents the same?

6. What was the total number of accidents the first week? The second week? How many fewer accidents were there the second week than the first week?

Multiplying Fractions As Decimals

1. From Mark's house to the lake is 3.8 miles. One week, Mark rode his bicycle to the lake and back on 4 days. To find how many miles he rode, you can multiply 3.8 by 8 or $3\frac{4}{5}$ by 8.

$3\frac{4}{5}$ 8 $6\frac{2}{5}$ 24 $30\frac{2}{5}$	3.8 8 30.4

Look at the work in the two boxes. When you multiply $3\frac{4}{5}$ by 8, you must first multiply $\frac{4}{5}$ by 8. Then you must multiply 3 by 8, and add the products.

You multiply 3.8 by 8 the way you multiply 38 by 8. Only, you are multiplying with tenths, so your answer will have tenths in it. Point off one decimal place to show tenths in your product. Are the two answers the same?

2. Mark's father has a boat with an outboard motor. It can go $7\frac{3}{4}$ miles an hour. On a camping trip, the boat had been traveling for 6 hours. To find about how far it had gone, you can multiply with a decimal.

7.75 6 46.50

$7\frac{3}{4} = 7.75$. In your answer, you can cross out the final decimal zero, for .50 is the same as .5.

Copy and multiply.

	a	b	c	d	e	f
3.	2.9 3	7.6 8	13.7 6	20.5 4	0.8 7	126.8 5
4.	4.09 7	5.38 3	9.75 4	1.706 3	.625 8	8.667 4
5.	3.6 12	7.25 48	.96 39	6.375 82	360.7 75	20.52 64

Multiplying by a Decimal

```
  80
 3.5
 400
240
280.0
```

1. Don and his father are going to plant some little pine trees on a hillside they want to reforest. They can plant about 80 trees an hour. How many trees can they plant in $3\frac{1}{2}$ hours?

To find out, multiply 80 by 3.5, since $3\frac{1}{2} = 3.5$. Since you are multiplying with *tenths*, point off *one decimal place* to show tenths in the product. How many trees can Don and his father plant?

```
  43
 2.5
215
86
107.5
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2. The Lanes started on a trip at 9:00 a.m. and plan to stop for lunch at 11:30, $2\frac{1}{2}$ hours later. If Mr. Lane averages about 43 miles an hour, how far will they go before lunch?

Copy the following examples and multiply. In each product, point off the same number of decimal places as there are in the multiplier.

	a	b	c	d	e	f
3.	18 .3	9 .6	76 .5	50 .8	635 .4	78 .09
4.	37 3.5	68 4.6	96 .75	82 .67	164 2.08	390 .47

5. Mrs. Lane has a rug $9\frac{3}{4}$ ft. by $6\frac{1}{2}$ ft. to be cleaned. The cleaner charges by the square foot. To find how many square feet there are in the rug, you can multiply with decimals. $9\frac{3}{4} = 9.75$ and $6\frac{1}{2} = 6.5$.

$$\begin{array}{r} 9.75 \\ \times\ 6.5 \\ \hline 4875 \\ 5850 \\ \hline 63.375 \end{array}$$

Estimate your answer. It will be a little more than 6×9, or 54. There are two decimal places in the multiplicand (9.75) and 1 decimal place in the multiplier (6.5), so there will be *three* decimal places in the product. (You are multiplying hundredths by tenths. $\frac{1}{100} \times \frac{1}{10} = \frac{1}{?}$)

How many square feet are there in the rug?

6. $\frac{1}{10} \times \frac{1}{10} = \frac{1}{?}$ So, 6.7×3.5 will have how many decimal places in the product?

The product of two decimals must have as many decimal places as the two factors have together.

7. When you multiply 8.42 by 3.6, how many decimal places will there be in the product?

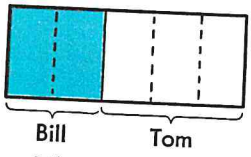
Copy and multiply.

	a	b	c	d	e	f
8.	.7 .9	.08 8	.09 .2	.75 .6	$4.75 .6	$9.80 .5
9.	4.9 2.8	4.85 5.9	49.7 1.5	$8.50 9.2	6.72 2.5	$7.50 .78

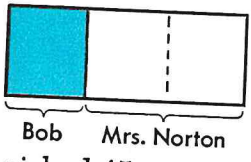
Find the products. Watch the number of decimal places.

	a	b	c
10.	1.6×8.69	9.6×90.3	$.04 \times 83.4$
11.	74×34.8	$9.6 \times \$1.84$	17.2×130.5
12.	5.43×147	6.09×107.6	$.007 \times 489$
13.	3.6×284	$39 \times \$12.50$	75.1×13.84
14.	18.9×389	86×12.406	7.29×368.2

Finding Shares



1. Bill and Tom mowed a large lawn for $2.50. Bill worked 2 hours and Tom worked 3 hours. They wanted to know how to divide the money. They worked 5 hours in all. So each boy should have $2.50 ÷ 5, for each hour's work. How much per hour is this? How much should Bill get? What is Tom's share?



2. Bob picked Mrs. Norton's cherry tree for her. They agreed that Mrs. Norton's share of the cherries was to be twice as large as Bob's share. Bob picked 45 quarts of cherries. How many did he get? How many quarts did Mrs. Norton get?

The following problems are quickies, but you may want to draw diagrams to help you solve them.

3. One hot day, Ellen made some lemonade to sell. Jean helped her sell it. The girls took in $1.20. Since Ellen had made the lemonade, her share of the money was to be three times as much as Jean's. How much did Ellen get? How much did Jean get?

4. Bob and Sue together picked 80 boxes of berries. They agreed to share the berries according to the time they worked. Bob worked four times as long as Sue. How many boxes should Bob have? How many boxes are Sue's share?

5. Mrs. Lane paid Tony, Jean, and Ann $1.50 for cleaning the yard. Tony worked 3 hours, Jean worked 2 hours, and Ann worked 1 hour. What should be Tony's share? Jean's share? Ann's share?

Using a Mileage Table

Cities	Boston	Bridge-port	Hartford	Middle-town	New Haven	New York	Provi-dence	Spring-field
Boston		152	101	116	134	209	42	89
Bridgeport	152		52	42	18	57	121	79
Hartford	101	52		15	35	109	75	25
Middletown	116	42	15		24	100	89	39
New Haven	134	18	35	24		74	104	60
New York	209	57	109	100	74		174	132
Providence	42	121	75	89	104	174		74
Springfield	89	79	25	39	60	132	74	

Mr. Lane frequently drives in New England. Here is part of the mileage table from the road map he uses.

1. How many miles is it from Boston to New York? From New Haven to Boston?

2. How far is it from Providence to Middletown?

3. What is the distance between Bridgeport and Providence? Between Providence and Boston?

4. How much farther is it from Hartford to New York than from Hartford to Providence?

5. Mr. Lane wants to drive from Boston to Springfield, and from Springfield to New York. How far is it from Boston to New York by this route?

6. One of Mr. Lane's business trips will take him from New York to Bridgeport, from Bridgeport to Hartford, from Hartford to Providence, and back to New York. How many miles will he drive on that trip?

Page 300 provides enrichment material which may be used after this page.

Dividing Fractions the Decimal Way

1. On a bicycle trip, Bill rode his bicycle 28.5 miles in 3 hours. To find how many miles an hour he averaged, you can divide $28\frac{1}{2}$ by 3 or 28.5 by 3.

$28\frac{1}{2} \div 3 =$

$\frac{\overset{19}{\cancel{57}}}{2} \times \frac{1}{\cancel{3}_{1}} =$

$\frac{19}{2} = 9\frac{1}{2}$

$$3\overline{)28.5} \quad 9.5 \quad 27 \quad 15 \quad 15$$

When you divide a decimal by a whole number, *place the decimal point in the quotient directly above the decimal point in the dividend,* just as when you divide dollars and cents.

Since 28.5 is a little more than 27, the quotient will be a little more than 9. How much more than 9 is it?

2. Sam was rowing across the lake. The lake was 3.5 miles wide. Sam wanted to know how far he had rowed when he was half way across. Divide 3.5 by 2. To make the answer come out exactly, write a zero after the .5, since .50 has the same value as .5. How many miles had Sam rowed?

$$2\overline{)3.50} \quad 1.75 \quad 2 \quad 15 \quad 14 \quad 10 \quad 10$$

3. Divide 45 exactly by 4. You can do this by putting a decimal point after the 45 and adding zeros. How many zeros must you add? What is the dividend?

Divide these examples until there is no remainder. Write more final zeros if needed. Check by multiplying.

	a	*b*	*c*	*d*	e
4.	$8\overline{)\$.96}$	$7\overline{)33.6}$	$5\overline{)\$3.15}$	$6\overline{)\$.48}$	$9\overline{)\$.54}$
5.	$4\overline{).072}$	$7\overline{).875}$	$8\overline{)59.2}$	$9\overline{)5.445}$	$4\overline{)1.8}$
6.	$5\overline{)3.8}$	$8\overline{)2.6}$	$5\overline{)4.52}$	$2\overline{)57.5}$	$8\overline{)2.8}$
7.	$25\overline{)13.5}$	$52\overline{)44.46}$	$18\overline{)62.1}$	$31\overline{)77.5}$	$27\overline{)33.75}$

Are You Sure of Fractions?

Do you remember how to compute with fractions? These examples will help you find out. Make sure of every answer.

Add.

	a	b	c	d	e
1.	$3\frac{1}{2}$ $2\frac{3}{8}$	$1\frac{3}{4}$ $2\frac{1}{2}$	$4\frac{1}{3}$ $4\frac{5}{6}$	$2\frac{1}{2}$ $5\frac{2}{5}$	$3\frac{2}{3}$ $3\frac{1}{4}$
2.	$1\frac{5}{8}$ $3\frac{1}{2}$ $2\frac{3}{4}$	$4\frac{1}{2}$ $3\frac{1}{3}$ $4\frac{5}{6}$	$7\frac{3}{5}$ $2\frac{9}{10}$ $5\frac{1}{2}$	$6\frac{5}{8}$ $8\frac{9}{16}$ $3\frac{3}{4}$	$9\frac{3}{4}$ $5\frac{5}{6}$ $10\frac{2}{3}$

Subtract.

3.	5 $2\frac{5}{8}$	$4\frac{7}{8}$ $4\frac{1}{4}$	$7\frac{1}{2}$ $3\frac{3}{4}$	$6\frac{1}{3}$ $5\frac{5}{6}$	$8\frac{11}{16}$ $3\frac{3}{4}$
4.	$9\frac{2}{5}$ $7\frac{9}{10}$	$8\frac{1}{5}$ $7\frac{1}{2}$	$6\frac{1}{2}$ $2\frac{2}{3}$	$10\frac{1}{3}$ $3\frac{3}{4}$	$12\frac{3}{4}$ $4\frac{1}{6}$

Multiply.

5.	6 $4\frac{1}{3}$	8 $5\frac{3}{4}$	12 $5\frac{2}{3}$	10 $6\frac{1}{4}$	15 $4\frac{4}{5}$
6.	\$.48 $3\frac{3}{4}$	\$1.60 $2\frac{1}{2}$	\$2.40 $6\frac{5}{8}$	$3\frac{3}{4}$ 6	$14\frac{1}{2}$ 9

Do what the signs tell you to do.

	a	b	c	d
7.	$\frac{1}{2} + \frac{3}{4}$	$\frac{2}{3} + \frac{1}{6}$	$\frac{9}{10} + \frac{3}{5}$	$\frac{2}{3} + \frac{1}{4}$
8.	$\frac{3}{4} - \frac{5}{8}$	$\frac{4}{5} - \frac{1}{2}$	$\frac{15}{16} - \frac{5}{8}$	$\frac{3}{4} - \frac{1}{3}$
9.	$\frac{1}{3} \times \frac{3}{4}$	$\frac{3}{4} \times 24$	$6 \times \frac{2}{3}$	$4\frac{1}{2} \times 6\frac{2}{3}$
10.	$\frac{1}{4} \div 2$	$\frac{7}{10} \div \frac{1}{10}$	$8 \div \frac{1}{4}$	$20 \div 2\frac{1}{2}$

Dividing to the Nearest Tenth

$$
\begin{array}{r}
9.39 \\
24\overline{)225.50} \\
216 \\
\hline
95 \\
72 \\
\hline
230 \\
216 \\
\hline
14
\end{array}
$$

1. Don's father wanted to know to the nearest tenth of a mile how many miles his pick-up truck was going on a gallon of gasoline. He knew that he had gone a total of 225.5 miles on 24 gallons of gasoline.

He divided 225.5 by 24. Since the division did not come out exactly, he carried it to the second decimal place. His answer was 9.39.

The rule for rounding to the nearest tenth is: If the figure in the hundredths place is 5 or more than 5 (5 is half of 10), the figure in the tenths place is increased by 1.

To the nearest tenth, how many miles per gallon was Don's father getting?

$$
\begin{array}{r}
7.95 \text{ or } 8.0 \\
9\overline{)71.60}
\end{array}
$$

2. Divide 71.6 by 9. Round your answer to the nearest tenth. Ninety-five hundredths rounds to how many tenths? Then what will the quotient, 7.95, become?

If the quotient had been 7.94, what would it be when rounded to the nearest tenth?

Round these decimal numbers to the nearest tenth.

	a	*b*	*c*	*d*	*e*	*f*
3.	7.63	12.76	8.07	14.55	9.94	9.96
4.	.54	1.16	29.91	.98	3.45	122.28

Divide to two decimal places. Then round each quotient to the nearest tenth.

5.	$7\overline{)25.8}$	$3\overline{)59.2}$	$9\overline{)3.42}$	$8\overline{)37}$	$6\overline{)59}$	$5\overline{)15.3}$
6.	$4\overline{)26.3}$	$12\overline{)41}$	$34\overline{)95.7}$	$47\overline{)116}$	$18\overline{)92.3}$	$52\overline{)805}$

Dividing to the Nearest Hundredth

1. In an automobile race, a car went 22.49 miles in 6 minutes. To find how many miles a minute it was averaging, divide 22.49 by 6 to the nearest hundredth. Here you must divide to *three* decimal places. If the figure in the thousandths place is 5 or more, increase the figure in the hundredths place by 1.

$$6\overline{)22.490} \quad 3.748 \text{ or } 3.75$$

Rounded to the nearest hundredth, what does the number 3.748 become?

2. Bill's friend Mr. Snyder has a sporting goods store. He ordered 5 baseball gloves of the same kind, at a total cost of $34.98. To the nearest cent, how much per glove was this?

$$5\overline{)\$34.980} \quad \$6.996$$

In the quotient, 996 thousandths (.996) rounded to the nearest *hundredth* is 100 hundredths or 1.00. Another way of saying this is that 99.6 cents, to the nearest cent, is $1.00. So to the nearest cent, $6.996 is $7.00.

How would you round $9.997 to the nearest cent?

Round these decimals to the nearest hundredth.

	a	b	c	d	e
3.	13.719	47.365	5.017	26.504	335.989
4.	$7.606	$4.995	$20.096	$43.003	$18.283

Divide to the nearest hundredth, by dividing to three decimal places and rounding.

5.	$3\overline{)16}$	$6\overline{)34.7}$	$9\overline{)57.465}$	$8\overline{)35.}$	$9\overline{)28.7}$
6.	$7\overline{)\$14.68}$	$9\overline{)\$22.27}$	$6\overline{)\$35.99}$	$12\overline{)\$43.25}$	$20\overline{)\$53}$
7.	$24\overline{)317}$	$47\overline{)95.44}$	$63\overline{)84.41}$	$35\overline{)\$59.98}$	$36\overline{)\$75}$

Pages 301 and 302 provide enrichment material which may be used after this page.

A Short Way To Multiply Decimals

$$\begin{array}{r} 125 \\ .01 \\ \hline 1.25 \end{array}$$

1. For his office, Mr. Lane bought 125 one-cent stamps. You find the cost of the stamps by multiplying \$.01 and 125. When 125 is multiplied by .01, *how many places to the left* is the decimal point in 125 moved? How much did Mr. Lane pay for the stamps?

$$\begin{array}{r} 25 \\ .1 \\ \hline 2.5 \end{array}$$

2. Bob bought 25 baby chicks at \$.10 each. \$.10 is .1 of a dollar, so the cost of the chicks is .1 × 25. When 25 is multiplied by .1, how many places to the *left* is the decimal point in 25 moved? How much did Bob pay for the chicks?

$$\begin{array}{r} \$1.75 \\ .10 \\ \hline \$17.50 \end{array}$$

3. Bob sold 10 chickens for \$1.75 each. He got 10 × \$1.75 for them. When \$1.75 is multiplied by 10, how many places to the *right* is the decimal point in \$1.75 moved? How much did Bob get for his ten chickens?

$$.01 \times 7.5 = .075$$
$$.1 \times 19.6 = 1.96$$
$$10 \times 3.27 = 32.7$$
$$100 \times 8.4 = 840.0$$

4. Look at the examples at the left. They will help you answer these questions.

a. *To multiply by .01,* how many places do you move the decimal point? In which direction do you move the decimal point?

b. *To multiply by .1,* how many places do you move the decimal point? In which direction do you move it?

c. *To multiply by 10,* how many places do you move the decimal point? In which direction?

d. *To multiply by 100,* you move the decimal point how many places? Which way?

In the following examples, multiply in the short way by moving the decimal point. On your paper, write only the products.

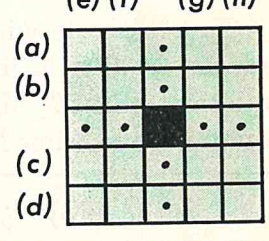
	a	*b*	*c*	*d*
5.	.01×238	.01×5.6	.01×307.25	.01×.7
6.	.1×27.4	.1×89	.1×17.75	.1×.3
7.	10×$4.39	10×4.625	100×$6.50	100×4.125
8.	.1×360	100×21.5	10×42.7	.01×15.8

Write only the products.

	a	*b*	*c*	*d*	*e*	*f*
9.	$3.95 × 10	6409 × .01	$12.50 × 100	2500 × .1	43.8 × 10	90.2 × 100
10.	.375 × 100	8.6 × 10	170.8 × .01	$29.64 × 10	4.6 × .1	80 × .01

Cross-Number Puzzles With Decimals

Copy the puzzle square at the right. Work examples *(a)*, *(b)*, *(c)*, and *(d)*, and write the answers *across* your square. Then work *(e)*, *(f)*, *(g)*, and *(h)*. Do the answers *down* check with the answers across?



Across: *(a)* .01 × 4352 *(b)* 13.057 rounded to the nearest hundredth *(c)* 10 × 8.604 *(d)* 109.27 ÷ 3, to the nearest hundredth. *Down:* *(e)* .1 × 418.3 *(f)* 33.656 to the nearest hundredth. *(g)* 10 × 5.004 *(h)* 132.09 ÷ 5 to the nearest hundredth.

Copy the puzzle square again and try it with these examples. *Across:* *(a)* .1 × 126.4 *(b)* 10 × 9.872 *(c)* .01 × 4263 *(d)* 354.37 ÷ 4, to nearest hundredth. *Down:* *(e)* 38.95 ÷ 2, to nearest hundredth *(f)* 28.284 rounded to nearest hundredth *(g)* 67.646 rounded to nearest hundredth *(h)* 10 × 4.239.

Dividing by a Decimal

a	*b*	*c*	*d*
$4\overline{)8}$	$40\overline{)80}$	$400\overline{)800}$	$4000\overline{)8000}$
2	2	2	2
8	80	800	8000

1. Look at the examples above. In *a*, the divisor is 4 and the dividend is 8. By what number have these two been multiplied to make the divisor and dividend of *b*? By what number have 4 and 8 both been multiplied to make the divisor and dividend of *c*? Of *d*? As you can see, the quotient has not changed.

This shows that: You can multiply both the divisor and the dividend of a division example by the same number and the quotient will remain the same.

Test this rule with some other numbers. In the example $10 \div 2 = 5$, multiply the 10 and the 2 by 3. Is the quotient still 5? Multiply the 10 and the 2 by 4. Is the quotient the same?

Long Way

$10 \times 2.5 = 25$

$10 \times 41.5 = 415$

2. We drove 41.5 miles on 2.5 gallons of gasoline. To find how many miles per gallon this was, divide 41.5 by 2.5.

You want to divide by a whole number. You can make the divisor, 2.5, a whole number by multiplying it by 10. If you do this, you must also multiply the dividend, 41.5, by 10.

What is your new divisor? What is your new dividend? Now divide 415 by 25. Add a decimal zero after the 5 in 415 to avoid having a remainder. How many miles a gallon did we get? To check, multiply your answer by 2.5.

There is a shorter way to do this problem. Place a caret (^) after 5 in the divisor and after 5 in the dividend to show that you have multiplied both numbers by 10. *Put the decimal point in the quotient directly above the caret.* Then divide as with whole numbers. Add as many zeros to the dividend as you need. Do you get the same answer you did when you divided 415 by 25?

Shorter Way

$$2.5_{\wedge})41.5_{\wedge}0 \quad 16.6$$

25
165
150
150
150

Copy and divide until there is no remainder. Some carets have been placed for you. Check by multiplying.

	a	b	c	d
3.	$.5_{\wedge})6.0_{\wedge}$	$.9)63.0_{\wedge}$	$.8)28.8$	$.7)3.78$
4.	$.3).42$	$.5)34$	$.6)5.1$	$.4)85.8$
5.	$\$.06_{\wedge})\$2.04_{\wedge}$	$.08_{\wedge})41.68_{\wedge}$	$2.5_{\wedge}).7_{\wedge}5$	$.31)14.57$
6.	$.25)32.5$	$\$.18)\$17.28$	$4.2)33.6$	$5.6)2184$
7.	$.19)27.55$	$.08)25.6$	$7.5)615$	$.87)104.4$
8.	$4.9)17.64$	$\$.15)\$15.30$	$.58)377$	$9.4)156.98$

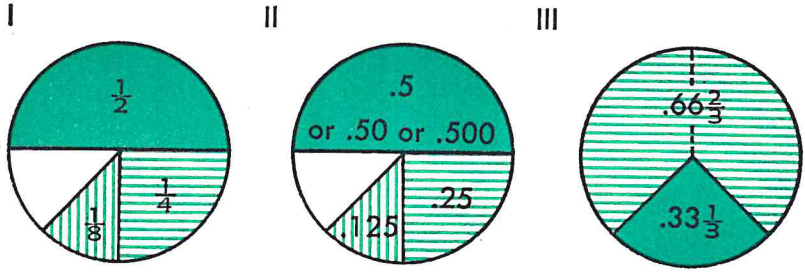
Divide to two decimal places and then round each quotient to the nearest tenth.

9.	$.3)7$	$.7).33$	$.9)16.4$	$.6)10.75$
10.	$1.3)3.7$	$.25)2.63$	$5.6)17.93$	$7.2)140$

Divide to the nearest hundredth by dividing to three decimal places and rounding.

11.	$.6)2.39$	$.3)17$	$.7)13.5$	$.9)61.43$
12.	$4.6)7.04$	$.13)4.4$	$2.1)4.375$	$7.3)68$

Common Fractions As Decimals



1. You have learned that many common fractions such as $\frac{3}{10}$, $\frac{1}{2}$, $\frac{4}{5}$, $\frac{1}{4}$, and $\frac{3}{4}$ can be written as decimal tenths and hundredths.

Other common fractions are often expressed as decimal thousandths. Circles I and II, above, are divided just alike. You know that $\frac{1}{2}$ of the circle is .5, or .50, or .500 of it. You can see that $\frac{1}{4}$ is half of $\frac{1}{2}$, so $\frac{1}{4}$ of the circle = $\frac{1}{2}$ of .50 = .25, or .250.

In the same way, $\frac{1}{8}$ is half of $\frac{1}{4}$. So $\frac{1}{8}$ of the circle = $\frac{1}{2}$ of .25, or .125. $\frac{3}{8}$ of the circle = 3 × .125 or .375. Write $\frac{5}{8}$ as a decimal. Write $\frac{7}{8}$ as a decimal.

2. You know that the quickest way to turn an improper fraction into a whole or mixed number is to divide the numerator by the denominator. For instance, the improper fraction $\frac{17}{4}$ becomes 17 ÷ 4, or $4\frac{1}{4}$.

$$3\overline{)2.00} \quad .66\frac{2}{3}$$

In the same way, *the numerator of* any fraction can be divided by the denominator. One meaning of $\frac{2}{3}$ is 2 ÷ 3. You can change $\frac{2}{3}$ to a decimal fraction by dividing 2 by 3. In decimal hundredths, $\frac{2}{3}$ = $.66\frac{2}{3}$. In decimal hundredths, what is $\frac{1}{3}$? (See Circle III above.) Now divide 1 by 3. Do you get the same answer as shown in Circle III above?

Change these fractions to decimal hundredths. Express remainders as fractions.

	a	*b*	*c*	*d*	*e*	*f*
3.	$\frac{5}{6}$	$\frac{1}{6}$	$\frac{3}{4}$	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{7}{12}$

Write these fractions as decimal tenths.

4.	$\frac{1}{2}$	$\frac{4}{5}$	$\frac{9}{10}$	$\frac{1}{5}$	$\frac{7}{10}$	$\frac{3}{5}$

Matching Decimals and Fractions

Number your paper 1 to 6 for each of the following matching tests. After each number write the letter which shows what decimal is the same as the fraction. So, in Set I, after **1** you write *(e)*, because .6 is the same as $\frac{3}{5}$.

	Set I		Set II		Set III	
1.	$\frac{3}{5}$	*(a)* .7	$\frac{7}{8}$	*(a)* .375	$\frac{1}{8}$	*(a)* .33$\frac{1}{3}$
2.	$\frac{3}{10}$	*(b)* .8	$\frac{3}{4}$	*(b)* .25	$\frac{1}{3}$	*(b)* .66$\frac{2}{3}$
3.	$\frac{1}{2}$	*(c)* .3	$\frac{2}{5}$	*(c)* .875	$\frac{7}{8}$	*(c)* .12$\frac{1}{2}$
4.	$\frac{4}{5}$	*(d)* .2	$\frac{1}{4}$	*(d)* .625	$\frac{3}{8}$	*(d)* .62$\frac{1}{2}$
5.	$\frac{7}{10}$	*(e)* .6	$\frac{5}{8}$	*(e)* .4	$\frac{2}{3}$	*(e)* .87$\frac{1}{2}$
6.	$\frac{1}{5}$	*(f)* .5	$\frac{3}{8}$	*(f)* .75	$\frac{5}{8}$	*(f)* .37$\frac{1}{2}$

Larger or Smaller?

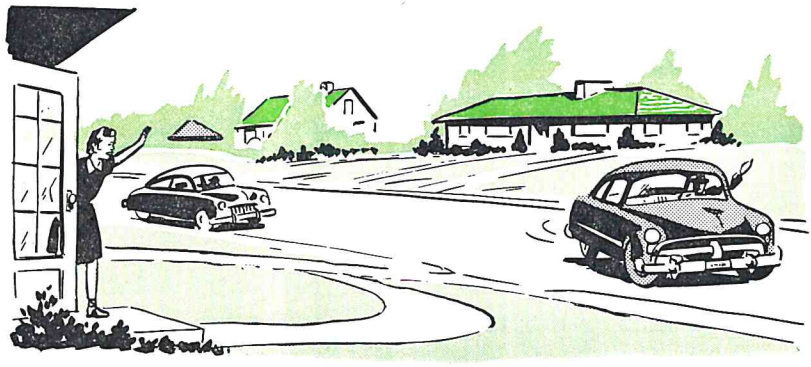
See if you can compare fractions and decimals.

1. Is $\frac{1}{2}$ larger or smaller than .4?
2. Is .73 larger or smaller than $\frac{3}{4}$?
3. Which is larger, $\frac{1}{5}$ or .1?
4. Which is smaller, .3 or $\frac{1}{3}$?

In each pair of numbers, select the larger number.

	a	*b*	*c*	*d*
5.	$\frac{2}{3}$ or .6	$\frac{2}{5}$ or .3	.7 or $\frac{5}{8}$	.8 or $\frac{7}{8}$
6.	$\frac{3}{5}$ or .65	.28 or $\frac{1}{4}$	$\frac{3}{8}$ or .35	.75 or $\frac{4}{5}$

Using Decimals



Decide whether you should multiply or divide to solve each problem below. Then do the problem.

1. Ann's father says his office is 2.7 miles from home. If he makes one round trip a day, and works 5 days a week, how many miles is this each week?

2. Sam earns $.45 an hour. How many hours will it take him to earn $6.75?

3. If Bill's Scout troop walks 3.25 miles an hour, how far can the troop hike in 2.6 hours?

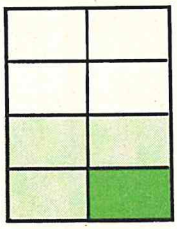
4. An airplane flew 100 miles in .4 hour. How many miles an hour was it going?

5. How much must Mr. Lane pay for 8.6 gallons of gasoline at 24.5 cents a gallon?

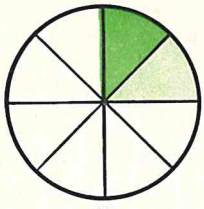
6. Mrs. Lane wants to buy $5 worth of strawberries to freeze. Strawberries are 35 cents a box. How many boxes can she buy? How much of her $5 will be left?

7. Tom's father estimates that last week he drove 68 miles in the city. He used 5.5 gallons of gasoline. To the nearest tenth of a mile, how many miles per gallon did he get in city driving?

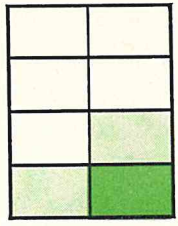
Understanding Decimal Fractions



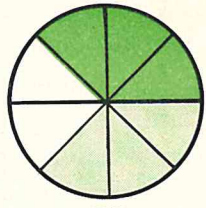
I



II



III

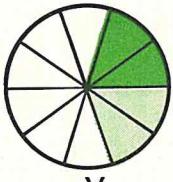


IV

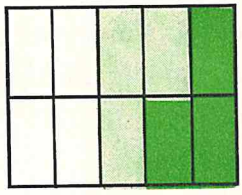
1. Diagram I shows that $4 \times .125 = .5$ and $.5 \div 4 = .125$. Diagram II shows that $2 \times .125 = .25$ and $.25 \div 2 = ?$

2. Diagram III shows that $3 \times .125 = ?$ and $.375 \div 3 = ?$

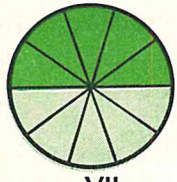
3. Diagram IV shows that $2 \times .375 = ?$ and $? \div 2 = .375$.



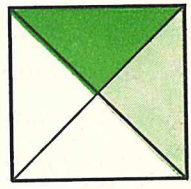
V



VI



VII



VIII

4. Diagram V shows that $2 \times .2 = ?$ and $.4 \div 2 = ?$

5. Diagram VI shows that $2 \times .3 = ?$ and $.6 \div 2 = ?$

6. Diagram VII shows that $2 \times .5 = ?$ and $1.0 \div 2 = ?$

7. Diagram VIII shows that $2 \times .25 = ?$ and $? \div 2 = .25$.

8. Draw a circle and divide it into sixths. Color or shade it to show that $2 \times .16\frac{2}{3} = .33\frac{1}{3}$ and that $.33\frac{1}{3} \div 2 = .16\frac{2}{3}$.

9. Draw a rectangle and divide it into six equal parts. Color or shade it to show that $4 \times .16\frac{2}{3} = ?$ and that $? \div 4 = .16\frac{2}{3}$.

Page 303 provides enrichment material which may be used after this page.

Using a Speedometer

To solve some of the problems on this page, you must use the answers to other problems.

Mr. Lane took his family on a three-day automobile trip. To keep a record of the cost of driving the car, Tony wrote down the number of miles shown by the speedometer each day. Here are the speedometer readings.

At the beginning of the trip	7321.2
At the end of the first day	7518.6
At the end of the second day	7828.4
At the end of the third day	8169.0

1. How many miles did the Lanes drive the first day?

2. How many miles did they go the second day?

3. How many miles did they go the third day?

4. How many miles did they drive in all? (In what two ways can you find the answer?)

5. How many more miles did the Lanes drive on the third day than on the first day? (Use Problems 1 and 3.)

6. How many miles a day did the Lanes average on their trip? (Use your answer to Problem 4.)

7. The Lanes bought 46 gallons of gasoline on their trip. To the nearest tenth, how many miles per gallon did they average? (Use your answer to Problem 4.)

8. Once, Tony noticed that in 30 minutes the figures on the speedometer went from 7589.8 to 7609.5. How many miles an hour were they going, on an average?

9. The 46 gallons of gasoline they used for the whole trip cost $11.73 in all. How many cents a gallon did the gasoline cost, on the average?

About Fractions and Decimals

When you answer each of the following questions, prove your answer with an example or an illustration.

1. If several fractions have the same numerators but different denominators, is the fraction with the largest denominator the largest or the smallest of the fractions?

2. If several fractions have the same denominators but different numerators, is the fraction with the largest numerator the largest or smallest of the fractions?

3. Does multiplying the numerator of a fraction make the fraction larger or smaller?

4. Does multiplying the denominator of a fraction make the fraction larger or smaller?

5. Is the value of a proper fraction more than 1 whole or less than 1 whole?

6. If all the figures in a decimal come *after* the decimal point, is the value of the decimal more or less than 1?

7. When you multiply a whole number by a proper fraction, will the product always be larger than the whole number or smaller than the whole number?

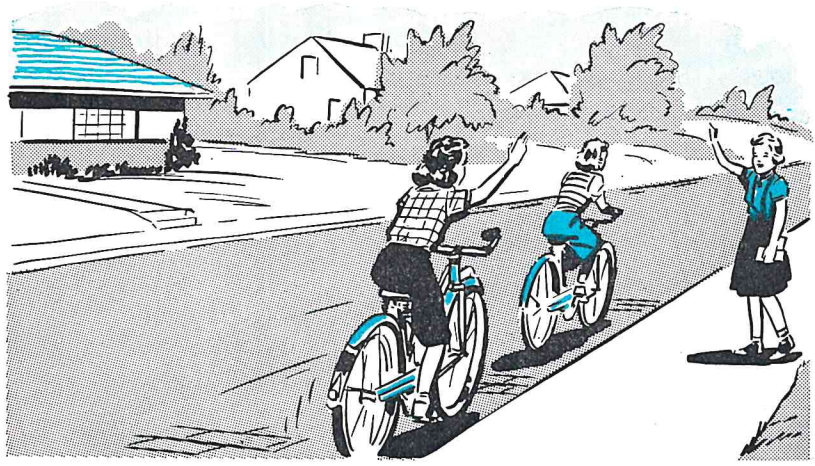
8. When you multiply a whole number by a mixed number, will the product be larger or smaller than the whole number?

9. When you multiply a whole number by a decimal smaller than 1, will the product be larger or smaller than the whole number?

10. When you divide a whole number by a proper fraction, will the quotient be larger or smaller than the number?

11. When you divide a whole number by a decimal smaller than 1, will the quotient be larger or smaller than the number?

Using Decimals



1. It is .9 of a mile from Debby's house to school. When the weather is good, Debby rides this distance on her bicycle 4 times a day. How many miles to and from school does she ride each day?

If you are not sure how to work this problem, think how you would solve it if the distance were 9 miles instead of .9 mile.

In each of the following problems, decide whether you should add, subtract, multiply, or divide.

2. Last year, the rainfall in Bob's state was 39.48 inches. What was the average monthly rainfall?

3. In Phoenix, Arizona, the average yearly rainfall is 7.81 inches. In Miami, Florida, the annual rainfall is 58.70 inches. How many more inches of rain fall in Miami than in Phoenix each year, on the average?

4. Sam's father found that his car was averaging 16.4 miles on a gallon of gasoline. At this rate, how many miles would 5 gallons take him?

5. On a trip last summer, Ken's family took the train from their home to Montrose, a distance of 172.6 miles. At Montrose, they hired a car and drove 38.7 miles to Trout Lake. How many miles did they travel from their home to Trout Lake?

6. Ellen, Ann, and Nancy gave a picnic supper for some of their friends. They spent $2.25 in all. If they share the cost equally, how much should each girl pay?

7. Bill can run 100 yd. in 13.2 seconds. The school record is 11.4 seconds. How much slower is Bill's time than the school record?

8. One day at the lake last summer, we went 21.5 miles in 2.5 hours in our motor boat. How many miles per hour did the boat go?

9. Dick and his older brother have built a log cabin with a floor 8.25 feet long and 6.5 feet wide. How many square feet of flooring do they need for the floor?

10. Our speedometer read 29864.9 miles when we started out. Now it reads 30021.6 miles. How far have we gone?

11. Sally's temperature is 102.5°. How many degrees above normal (98.6°) is Sally's temperature?

12. How much will Mr. Lane pay for 10 gallons of gasoline at 24.4 cents a gallon?

13. Nora's father was going to build a bookcase for some of her books. Nora wanted to know how many books she could put on each shelf if it were 30 inches long. She found that her books averaged about 1.25 inches thick. How many books would go on a shelf?

14. We drove 8.7 miles to a drive-in theater and 10.2 miles coming back. How much longer was the way back?

A Short Way To Divide Decimals

```
      3.475
1000)3475.000
     3000
      475 0
      400 0
       75 00
       70 00
        5 000
        5 000
```

1. Mr. Gray needs 3475 feet of lumber to build an addition to his barn. Lumber is sold by the thousand feet. To find how many thousand feet of lumber Mr. Gray needs, divide 3475 by 1000.

The division is shown in the box at the left. Compare the quotient with the dividend. How many places to the left was the decimal point moved?

```
   6.49
10)64.90
  60
   4 9
   4 0
     90
     90
```

```
    3.715
100)371.500
   300
    71 5
    70 0
     1 50
     1 00
      500
      500
```

2. Study the two examples in the boxes. When 64.9 was divided by 10, how many places to the left was the decimal point moved? When 371.5 was divided by 100, how many places to the left was the decimal point moved?

This shows that: To divide a decimal by 10, 100, or 1000, move the decimal point as many places to the left as there are zeros in the divisor.

Write only the quotients for these examples.

	a	*b*	*c*
3.	9.5 ÷ 10	187.3 ÷ 100	1784 ÷ 1000
4.	850 ÷ 100	3750 ÷ 100	800 ÷ 1000
5.	$3.70 ÷ 10	$67.00 ÷ 100	$5.00 ÷ 100
6.	7 ÷ 100	3 ÷ 10	2700 ÷ 1000

Adding and Subtracting Measures

Do you remember how to add and subtract measures?

Add the following measures.

	a	b	c
1.	13 ft. 11 in. 7 ft. 9 in.	1 bu. 16 qt. 3 bu. 24 qt.	3 tons 1500 lb. 2 tons 1750 lb.
2.	8 lb. 10 oz. 4 lb. 12 oz. 3 lb. 9 oz.	5 ft. 9 in. 4 ft. 11 in. 6 ft. 6 in.	2 gal. 3 qt. 1 gal. 2 qt. 3 qt.
3.	3 hr. 45 min. 50 min. 1 hr. 35 min.	4 min. 15 sec. 8 min. 32 sec. 48 sec.	18 yd. 2 ft. 9 yd. 1 ft. 10 yd. 2 ft.
4.	3 yr. 9 mo. 8 yr. 11 mo. 12 yr. 8 mo.	8 yd. 27 in. 1 yd. 30 in. 5 yd. 9 in.	3 lb. $14\frac{1}{2}$ oz. 5 lb. $1\frac{1}{4}$ oz. 14 lb. $12\frac{1}{4}$ oz.

Subtract these measures. Check by adding.

5.	5 gal. 2 gal. 3 qt.	13 yr. 5 mo. 9 yr. 11 mo.	5 lb. 13 oz. 2 lb. 9 oz.
6.	6 ft. 1 in. 5 ft. 3 in.	11 hr. 5 min. 8 hr. 30 min.	10 min. 9 min. 47 sec.
7.	5 da. 3 da. 15 hr.	2 mi. 1 mi. 440 yd.	5 ft. 6 in 4 ft. $8\frac{3}{4}$ in.

Do what the signs tell you to do.

8. 3 ft. + 4 ft. 3 in. + 5 ft. 7 in. + 11 in.
9. 22 yr. 5 mo. − 13 yr. 7 mo.
10. 2 lb. 4 oz. + 14 oz. + 5 lb. 2 oz. + 3 lb.

Page 304 provides enrichment material which may be used after this page.

Circle Graphs and Picture Graphs

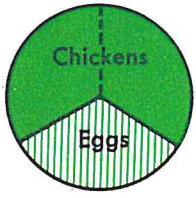
Ann's Day

1. This circle graph shows how Ann spends her day. (How many hours does a "day" have in it?) Look at the graph and see if you can answer the following questions as quickies.

a. About how many hours a day does Ann spend sleeping and eating?

b. About how many hours a day is she in school?

c. About what fraction of a day does Ann have left for other things?

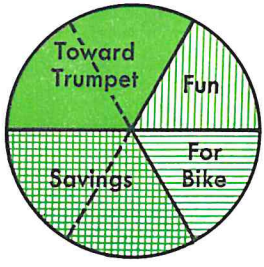


Bob's Income

2. One year, Bob got about $180 from the sale of eggs and chickens.

a. According to the graph, what fraction of Bob's income came from eggs? How much money was this?

b. What fraction came from selling chickens? How much money was this?



Joe's Plan

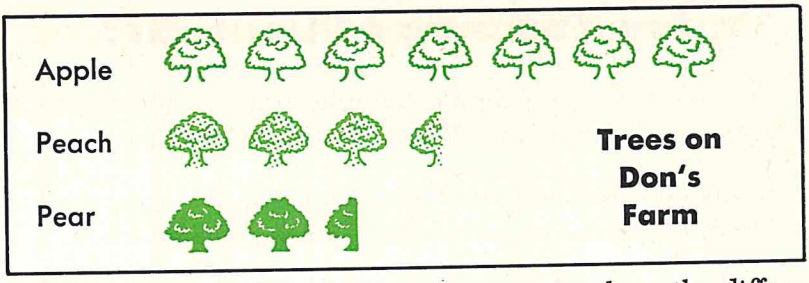
3. Last summer, Joe cleared about $48 mowing lawns with his father's power mower. Joe wanted a new trumpet, and a new lamp and some other things for his bike. He wanted to start a savings account so that he could go to camp next summer. The graph shows how Joe planned to use his money. The graph will help you answer these questions.

a. How much money did Joe use for his new trumpet?

b. How much money can he spend on his bike?

c. How much money goes into Joe's savings account?

d. How much will he spend for fun?



4. Don and his father made a *pictogram* to show the different kinds of trees on their fruit farm. Each tree in the picture stands for 100 trees. Look at the pictogram for the answers to these questions.

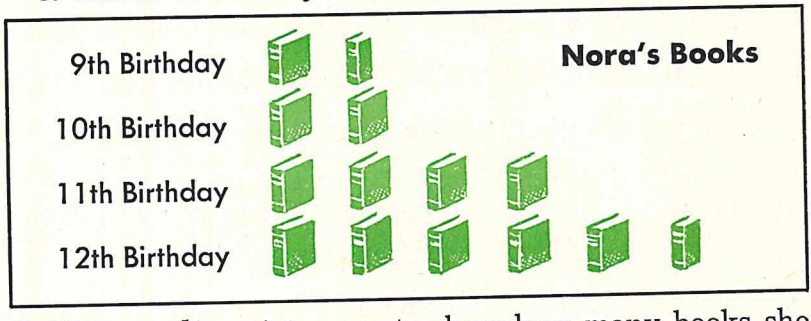
a. How many apple trees are there on the farm?

b. How many peach trees are there?

c. How many times as many apple trees are there as peach trees?

d. About how many pear trees does Don's father have?

e. About how many trees are there in all?



5. Nora made a pictogram to show how many books she owned on each birthday. Each picture stands for 10 books. On her 9th birthday, Nora owned 15 books.

a. How many books did she own on her 10th birthday?

b. How many books did she own on her 11th birthday?

c. How many books did she own when she was 12? How many more books was this than when she was 9?

Pages 305 and 306 provide enrichment material which may be used after this page.

Are You Sure of Decimals?

By this time, you should be able to add, subtract, multiply, and divide decimals easily and accurately.

Copy and add these numbers. Point off the right number of decimal places in each sum. Check your answers.

	a	*b*	*c*	*d*	*e*
1.	.6 .9 .5	.34 .42 .96	4.7 13.9 7.0	12.83 9.24 84.55	7.105 3.768 10.157
2.	4.20 7.57 3.64 4.75	73.6 69.2 43.8 33.5	3.189 7.695 23.805 1.640	323.5 86.2 8.7 357.6	$96.86 522.08 96.39 873.80

Copy in columns and add.

	a	*b*
3.	6.9, 12.4, 6.2, 5.0	5.67, 10.11, 4.75, 28.87
4.	13.00, 16.18, 9.89, 8.63	$7.51, $3.14, 89¢, $12

Copy and subtract. Check your answers by adding.

	a	*b*	*c*	*d*	*e*
5.	17.2 8.5	1.15 .66	94.51 59.03	136.0 75.8	0.947 0.739
6.	$12.30 7.83	6.180 3.279	963.5 284.0	239.00 49.42	1637.0 927.1

Copy in columns, subtract, and check.

	a	*b*	*c*
7.	$2.00 — 70¢	1.23 — .96	10.4 — 6.5
8.	137.1 — 56.5	356.03 — 87.89	1.307 — .798
9.	$20.00 — $5.35	1279.1 — 448.8	$320 — $160.29

Copy and multiply. Be sure to check your work.

	a	b	c	d	e
10.	$\begin{array}{r} 9 \\ \times\ .6 \\ \hline \end{array}$	$\begin{array}{r} 65 \\ \times\ .3 \\ \hline \end{array}$	$\begin{array}{r} 823 \\ \times\ .08 \\ \hline \end{array}$	$\begin{array}{r} 46 \\ \times\ 2.7 \\ \hline \end{array}$	$\begin{array}{r} 580 \\ \times\ .16 \\ \hline \end{array}$
11.	$\begin{array}{r} .7 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 50.8 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 6.57 \\ \times\ 8 \\ \hline \end{array}$	$\begin{array}{r} 1.375 \\ \times\ 4 \\ \hline \end{array}$	$\begin{array}{r} \$7.95 \\ \times\ 29 \\ \hline \end{array}$
12.	$\begin{array}{r} .8 \\ \times\ .5 \\ \hline \end{array}$	$\begin{array}{r} 1.8 \\ \times\ .9 \\ \hline \end{array}$	$\begin{array}{r} .27 \\ \times\ .7 \\ \hline \end{array}$	$\begin{array}{r} 46.9 \\ \times\ .8 \\ \hline \end{array}$	$\begin{array}{r} \$3.76 \\ \times\ .6 \\ \hline \end{array}$
13.	$\begin{array}{r} \$9.50 \\ \times\ 3.5 \\ \hline \end{array}$	$\begin{array}{r} 42.8 \\ \times\ 2.4 \\ \hline \end{array}$	$\begin{array}{r} 7.84 \\ \times\ 9.3 \\ \hline \end{array}$	$\begin{array}{r} 236 \\ \times\ 9.5 \\ \hline \end{array}$	$\begin{array}{r} 60.9 \\ \times\ 1.04 \\ \hline \end{array}$

Copy and multiply. Watch the number of decimal places in your products.

	a	b	c
14.	$.7 \times 139$	$.65 \times 24$	$.8 \times \$10.50$
15.	75×6.74	3.9×23.6	14×3.875

Divide until there is no remainder and check.

	a	b	c	d
16.	$6\overline{)4.5}$	$5\overline{)\$7.10}$	$8\overline{)18.8}$	$9\overline{)4.86}$
17.	$18\overline{)31.5}$	$36\overline{)882}$	$45\overline{)\$21.60}$	$29\overline{).696}$

Divide to the nearest tenth.

18.	$7\overline{)40}$	$40\overline{)95}$	$17\overline{)45}$	$23\overline{)820}$

Divide to the nearest hundredth.

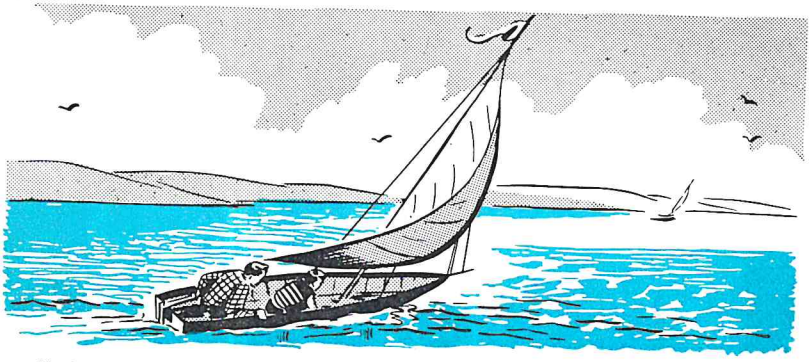
19.	$6\overline{)28}$	$32\overline{)\$20.45}$	$46\overline{)278.4}$	$100\overline{)\$39.85}$

Divide until there is no remainder and check.

20.	$.8\overline{)39.2}$	$.5\overline{)4.8}$	$.09\overline{)5.67}$	$\$.06\overline{)\$2.34}$
21.	$9.3\overline{)1.116}$	$6.2\overline{)52.7}$	$\$.96\overline{)\$27.84}$	$.75\overline{)456.75}$

Page 307 provides enrichment material which may be used after this page.

Decimals in Two-Step Problems



See whether you can solve some of these problems as quickies.

1. Tom spent last summer at the seashore. His uncle's sailboat needed 6 feet of water. A sandbar was 1.9 ft. under water at low tide. One day, high tide raised the water 4.4 ft. By how much could the boat clear the sandbar at high tide?

2. When Don started on a bicycle trip one day, his speedometer read 127.5 miles. After he had been riding for two hours, the speedometer read 149.1 miles. How many miles an hour had Don averaged?

3. Nancy lives .6 mile from school. She walks this distance four times each school day, since she comes home for lunch. How far does she walk between her home and school in a school week of 5 days?

4. Mr. Lane uses about 20 gallons of gasoline a week. Last week the price of gasoline dropped from 25.4¢ a gallon to 23.9¢ a gallon. How much will Mr. Lane save on his gasoline bill this week?

5. If lumber costs $180 per M (thousand feet), how much must Don's father pay for 2735 feet?

6. Bob bought 350 pounds of feed for his chickens. The feed cost $4.60 per hundredweight (100 pounds). How much did Bob have to pay?

7. Bill and his father are going to build an outdoor fireplace. They think they will need about 375 bricks. If bricks cost $4.50 a hundred, how much will the bricks for their fireplace cost?

8. Our water meter shows that we have used 6500 cubic feet of water in the last six months. (A cubic foot of water is enough water to fill a container a foot square and a foot high.) If water is $1.45 per thousand cubic feet, how much will our bill be?

9. In June, 2.97 inches of rain fell in Don's state. In July, the rainfall was 3.08 inches, and in August .79 inch. What was the average monthly rainfall?

10. Jim's club made 55¢ by selling candy bars and 95¢ by renting their bicycles. How many 25-cent magazines can they buy with the money they have earned?

11. Bill's Scout troop has started on a 12-mile hike. The first hour they walked 3.6 miles. The second hour they walked 2.9 miles. How many miles do they still have to go?

12. The speedometer in our car read 39886 miles when we filled the gasoline tank in our car. It read 40051 miles the next time we filled it with 9.8 gallons of gasoline. How many miles per gallon had we averaged?

13. In the state where Ann lives, there is a state tax of 4.4 cents on each gallon of gasoline to build roads. Ann's father buys about 30 gallons of gasoline a month. At this rate, how much a year is he paying in gasoline tax to be used for state roads?

Multiplying Measures

Add	Multiply
1 lb. 7 oz. 1 lb. 7 oz. 1 lb. 7 oz. 1 lb. 7 oz.	1 lb. 7 oz. 4
4 lb. 28 oz. =	4 lb. 28 oz. =
5 lb. 12 oz.	5 lb. 12 oz.

1. Nora has ordered a set of 4 books to be sent by mail. Each book weighs 1 lb. 7 oz. To find the total weight of the books, you can add or you can multiply.

The example shows the work done both ways. Which seems to be quicker and easier? Either way, you need to know how to change ounces into pounds in order to put your answer in simplest terms. What was the total weight of the books?

5 hr. 15 min. 5
25 hr. 75 min. = 26 hr. 15 min.

2. Linda is in school 5 hr. 15 min. every school day. How much time does she spend in school every week?

Explain how to multiply 5 hr. 15 min. by 5, as shown in the box.

Copy and multiply.

	a	*b*	*c*
3.	6 ft. 5 in. 4	4 yd. 2 ft. 4	3 qt. 1 pt. 5
4.	2 hr. 25 min. 6	1 min. 33 sec. 4	2 gal. 3 qt. 4
5.	4 lb. 6 oz. 8	1 qt. 1 pt. 3	8 yd. 2 ft. 4
6.	7 hr. 45 min. 6	5 ft. 8 in. 5	6 lb. 7 oz. 10
7.	2 bu. 20 qt. 3	2 tons 1250 lb. 4	1 mi. 880 yd. 4

Dividing Measures

1. The 4 runners on Bill's relay team ran a relay race in 5 min. 32 sec. To find the average time for each runner, divide 5 min. 32 sec. by 4.

$$\begin{array}{r} 1 \text{ min. } 23 \text{ sec.} \\ 4\overline{)\,5 \text{ min. } 32 \text{ sec.}} \\ \underline{4} \\ 1 \text{ min. } 32 \text{ sec.} \end{array}$$
$$= 92 \text{ sec.}$$

The work is shown in the box. You change the remainder of 1 minute to 60 seconds and add it to the 32 seconds, then divide 92 by 4.

What was the average time for each runner?

Check by multiplying 1 min. 23 sec. by 4. Is your product 5 min. 32 sec.?

2. Don's father had 7 tons 350 lb. of lime to put on a 5-acre field. To find how much lime he should put on each acre, divide 7 tons 350 lb. by 5.

$$\begin{array}{r} 1 \text{ ton } 870 \text{ lb.} \\ 5\overline{)\,7 \text{ tons } 350 \text{ lb.}} \\ \underline{5} \\ 2 \text{ tons } 350 \text{ lb.} \end{array}$$
$$= 4350 \text{ lb.}$$

Explain the work in the box.

How much lime should Don's father put on each acre?

Check by multiplying the answer by 5.

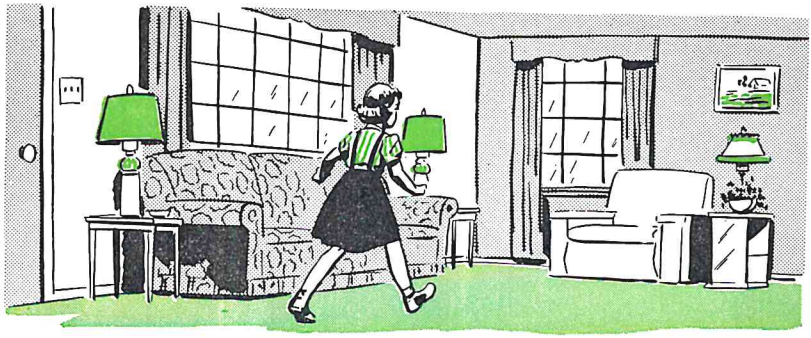
Copy and divide. Check by multiplying.

	a	*b*	*c*
3.	$5\overline{)27 \text{ ft. } 11 \text{ in.}}$	$4\overline{)14 \text{ lb. } 4 \text{ oz.}}$	$2\overline{)3 \text{ wk. } 5 \text{ da.}}$
4.	$5\overline{)8 \text{ yd. } 1 \text{ ft.}}$	$2\overline{)7 \text{ hr. } 36 \text{ min.}}$	$7\overline{)24 \text{ qt. } 1 \text{ pt.}}$
5.	$3\overline{)19 \text{ hr. } 30 \text{ min.}}$	$6\overline{)13 \text{ ft. } 0 \text{ in.}}$	$6\overline{)22 \text{ gal. } 2 \text{ qt.}}$
6.	$3\overline{)35 \text{ yr. } 3 \text{ mo.}}$	$4\overline{)18 \text{ min. } 40 \text{ sec.}}$	$2\overline{)5 \text{ yd. } 14 \text{ in.}}$
7.	$5\overline{)13 \text{ tons } 1000 \text{ lb.}}$	$5\overline{)11 \text{ bu. } 13 \text{ qt.}}$	$4\overline{)1 \text{ mi. } 880 \text{ yd.}}$

Can you make up problems for some of the examples?

Pages 308 and 309 provide enrichment material which may be used after this page.

Using Measures



1. Peggy is measuring the length of the living room by "stepping it off." If each of her steps is 2′4″ long, and it takes 8 steps to go the length of the room, how long is the room?

Before you work each of the following problems, decide whether you should multiply or divide.

2. Dick wants to saw a board 11 ft. 8 in. long into 4 equal pieces. How long will each piece be?

3. Bob sold 5 chickens. Their total weight was 17 lb. 8 oz. What was the average weight?

4. Nancy has promised to practice 2 hours this week. If she practices 23 minutes a day for 5 days, will she have practiced long enough?

5. Tony was timing his father's driving. They went 8 miles in 11 min. 20 sec. On an average, how long did it take them to go one mile.

6. The sum of the ages of Bob, Don, and Sam is 35 yr. 9 mo. What is their average age?

7. Four loads of coal have been delivered to Jill's school. If there were 3 tons 1500 pounds in each load, how many tons of coal have been delivered?

8. Mr. Gray used 8 gal. 1 qt. of oil in his truck in 3 months. How much oil a month did he use?

9. Dick is making a cupboard for his mother. There are to be 4 shelves, each one 2 ft. 5 in. long. How long a board must he get if all the shelves are to be cut from it?

10. The total height of the 5 players on our school basketball team is 28 ft. 9 in. Find their average height.

11. Jill and her mother want to make curtains for the three windows in their kitchen. There are to be two curtains for each window. Each curtain will take 1 yd. 2 ft. of material. How much material should they buy?

12. Don wants to mark off the long side of his garden into four equal parts. The garden is 29 yd. 1 ft. long. How far apart should Don's markers be?

13. Nancy has promised to practice 2 hr. 30 min. in 6 days this week. On an average, how many minutes a day should she practice?

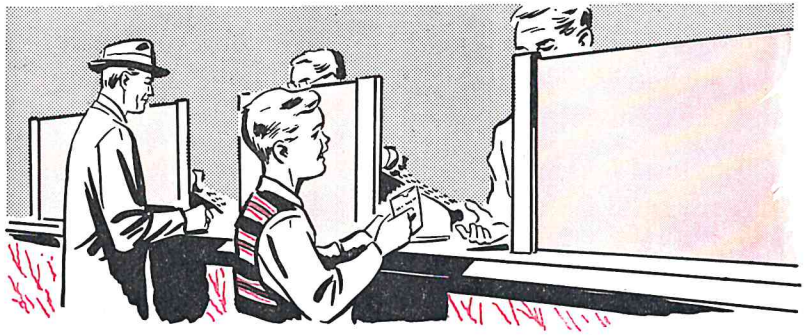
14. The boys in Sam's archery club are ordering 5 sets of bows and arrows by mail. Each set weighs 2 lb. 14 oz. What is the total shipping weight of the 5 archery sets?

15. Bill read that in a 4-mile college rowing race the winning boat finished in 17 min. 52 sec. On an average, how long did it take this crew to row a mile?

16. Jean's committee is planning to paint a mural in 3 equal panels to go on a wall 13 ft. 9 in. long. How long should each panel be?

17. Last summer, Sue helped her mother make tomato juice. One day they made 3 kettlefuls with 2 gal. 2 qt. in each kettleful. How many gallons and quarts of tomato juice did they make that day?

Finding Averages



1. At the end of each month, Bob deposits in the savings bank the money he has saved that month. In September, he deposited \$22.40; in October, \$16.25; in November, \$14.27; and in December, \$25.00. How much did Bob deposit each month on the average?

Which two processes did you use in this problem to find the average?

2. Nora wanted to find out how many pages a day, on the average, she was reading outside of her school work. In six days one week she read 20, 15, 36, 7, 18, and 42 pages. What was the average number of pages per day she was reading?

3. Bill is keeping a record of the number of miles he rides on his bicycle, to find out how much he uses it each day. On Monday he rode 5.2 miles, on Tuesday 7 miles, on Wednesday 3.9 miles, on Thursday 0 miles, on Friday .8 mile, and on Saturday 15.5 miles. Find the average daily mileage for the 6 days.

4. In 5 days this week, Joe has practiced on his trumpet $\frac{1}{3}$ hr., $\frac{3}{4}$ hr., $\frac{1}{3}$ hr., $\frac{5}{12}$ hr., and $1\frac{1}{2}$ hr. On the average, how long, in hours, has he practiced each day? How many *minutes* of practice did he average per day?

5. The four boys on a relay team timed themselves. Jim ran his distance in $28\frac{4}{5}$ sec., Sam in $30\frac{1}{2}$ sec., Dick in $29\frac{9}{10}$ sec., and Bob in $32\frac{3}{10}$ sec. What was their average time? (You may want to change fractions to decimals before you add.)

6. Dave is 10 years 11 months old, Terry is just 13 years old, and Ken is 12 years 4 months old.

a. What is their average age?

b. Is Ken older or younger than the average age? How many months older or younger?

7. One day, Sam caught 4 fish. They weighed 2 lb. 4 oz., 4 lb., 1 lb. 13 oz., and 3 lb. 7 oz. What was the average weight per fish?

8. Eight pupils in Bill's class are making a study of how many hours a week they watch television. Last week, they looked at television for the following number of hours: 16, $4\frac{3}{4}$, 9, $11\frac{1}{2}$, 7, 22, $8\frac{1}{4}$, and $10\frac{1}{2}$.

a. What was the average number of hours each pupil watched television that week?

b. How many hours over the average was the pupil who spent 22 hours watching television?

9. In a relay race, Tom ran his lap in 1 min. 29 sec., Jerry's time was 1 min. 34 sec., Joe's was 1 min. 37 sec., and Bill's was 1 min. 24 sec.

a. What was their average time?

b. How much faster than the average did Bill run?

c. How much slower than the average time was Joe's?

10. Ann is 4 ft. 9 in. tall, Ellen is 5 ft., and Jean is 5 ft. 3 in. What is their average height? (This problem is a quickie.)

Another Way to Compare Numbers

Peggy is captain of a girls' softball team. Last year, the team won 7 of the 10 games they played. This year, they played 12 games and won 9. Peggy wants to know which record is better.

1. Peggy can compare the records by *subtracting*. Last year, how many more games did the team win than it lost? How many more did it win than it lost this year?

2. Peggy can compare the records by *dividing*. Last year, the girls won $7 \div 3$, or $2\frac{1}{3}$ times as many games as they lost. This year, how many times as many games did they win as they lost?

3. Peggy can compare with *fractions*. Last year, the girls won $\frac{7}{10}$ of their games. What fraction of their games did the girls win this year?

4. The best way for Peggy to compare is with *per cents*. A per cent is a way of writing *hundredths*. If you change both fractions to hundredths, they will be the same kind of fractions and you can see at once which one is larger.

Last year, the team won $\frac{7}{10} = \frac{70}{100} = 70\%$ (read "seventy *per cent*") of their games. This year, they won $\frac{9}{12} = \frac{3}{4} = \frac{75}{100}$ of their games. What per cent is $\frac{75}{100}$? Which year's record is the better one?

The sign % means per cent or hundredths. "Per cent" means "by the hundred."

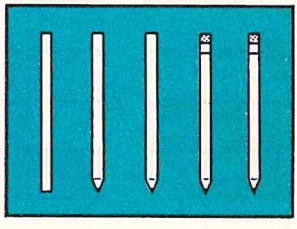
A per cent is a fraction with 100 for a denominator.

$$\frac{9}{15} = \frac{3}{5} = \frac{60}{100} = 60\ \%$$

5. Jerry is saving money to buy a $15 radio for his room. He has saved $9. To find what per cent of the price of the radio he has saved, change $\frac{9}{15}$ to a per cent. $\frac{9}{15} = \frac{3}{5}$. How many hundredths is $\frac{3}{5}$? What per cent is this?

6. Bill's basketball team won 8 of the 10 games they played. What part of their games did they win? What per cent is this?

7. Jean has these five colored pencils at school. What per cent of them have erasers? What per cent are without erasers? What per cent of the pencils are sharpened? What per cent are not sharpened?



8. There are 10 houses in the block where Ann lives. Seven of the houses have television sets. What per cent have television? What per cent do not?

9. Jean colored 12 Easter eggs. She made 3 of them blue, 6 of them red, and the rest of them yellow.

a. What fraction of the eggs were blue? Then what per cent of the eggs were blue?

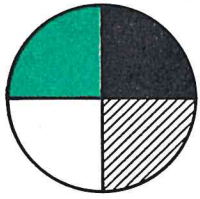
b. What fraction of the eggs were red? What per cent?

c. What per cent of the eggs were yellow?

10. Don picked 20 ears of corn this morning. He put aside 8 ears for the family's dinner. What per cent of the corn was the family to have?

Don sold the rest of the corn to Mrs. Scott. What per cent did he sell?

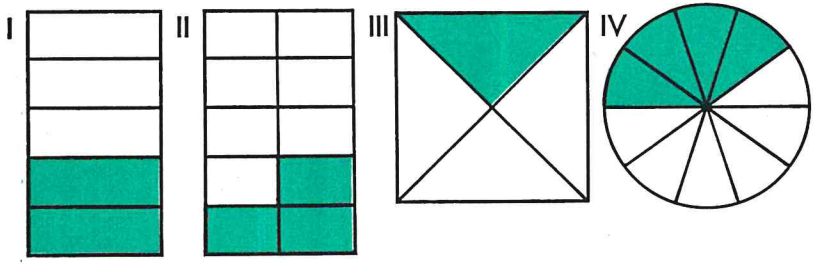
Showing Per Cents



1. a. What fraction of this circle has been colored? What per cent is colored?

b. 25% of the circle is black. What per cent of the circle do the black and colored parts make together? What fraction?

c. Another 25% of the circle has been shaded. Altogether, what per cent of the whole circle is in color, black, and shaded? What fraction of the circle is in color, black, and shaded?



2. a. What fraction of Figure I has been colored? What per cent is colored?

b. What fraction of Figure I is white? What per cent of the figure is white?

3. a. What fraction of Figure II has been colored? What per cent is colored?

b. What fraction of Figure II is white? What per cent is white?

4. What per cent of Figure III is colored? What per cent is white? What per cent of the square do these two per cents equal?

100% means the whole.

5. 40% of Figure IV is colored. What per cent more will have to be colored to have 100% of the circle colored?

Fractions and Per Cents

If you can change a fraction to a decimal, it is easy to change the fraction to a per cent.

1. There are 28 pupils in Sylvia's room. Only 7 of them are girls. What per cent of the pupils are girls?

$\frac{7}{28}$ or $\frac{1}{4}$ are girls. You know that $\frac{1}{4} = .25$, so $\frac{1}{4} = 25\%$.

2. Jerry bought a packet of 36 stamps. Twenty-seven of them were canceled. What per cent of the stamps were canceled? $\frac{27}{36} = \frac{3}{4} = 75\%$

3. Bob put 200 eggs in his incubator to hatch. Only 180 of the eggs hatched. What per cent of them hatched?

$$\frac{180}{200} = \frac{18}{20} = \frac{9}{10} = 90\%$$

4. Write these fractions as per cents:

a. $\frac{1}{10}$ **b.** $\frac{1}{2}$ **c.** $\frac{1}{5}$ **d.** $\frac{4}{5}$ **e.** $\frac{3}{10}$ **f.** $\frac{7}{10}$

Find what per cent:

	a	*b*	*c*
5.	5 is of 10	7 is of 10	6 is of 15
6.	4 is of 16	16 is of 20	12 is of 15
7.	15 is of 60	20 is of 100	30 is of 50
8.	7 is of 70	9 is of 30	27 is of 36

You can also change a per cent to a fraction.

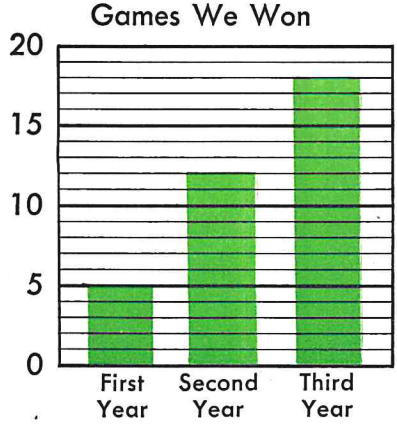
9. Last summer, Jean saw this sign in a store window: "Handbags, 20% off." $20\% = \frac{20}{100} = \frac{1}{5}$. Then what did the sign mean?

10. When winter coats are being sold at a reduction of 25%, the reduction is what fraction of their original cost?

11. Write these per cents as fractions in lowest terms:

a. 10% **b.** 40% **c.** 75% **d.** 50% **e.** 80% **f.** 60%

Graphs and Per Cents

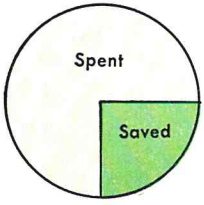


1. For three years now, our school baseball team has played 20 games each year. This bar graph shows how many games we won each year. From the graph, you can work out what per cent we won of the games we played.

a. The first year, we won 5 out of 20 games. What per cent was this?

b. The second year, how many games did we win? What per cent did we win?

c. How many games did we win the third year? What per cent of all our games was this?

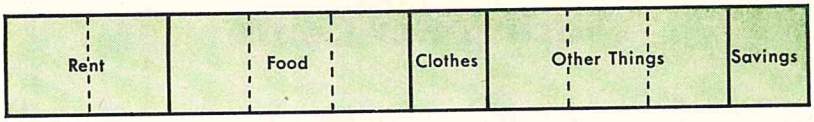


2. Tom gets an allowance of $2.00 a week. The circle graph at the left shows how he used his allowance one week.

a. What per cent of his allowance did he spend? How much did he spend?

b. What per cent of his allowance did Tom save? How much money did he save?

3. This rectangle graph shows how many miles the Lanes have gone on a trip of 500 miles. The colored part shows how far they have gone, and the white part how far they still have to go. What per cent of their trip have they completed? What per cent do they still have left to drive?



4. The graph above represents Mr. Lane's salary for one year.

a. What fraction of his salary does each small section of the graph represent? What per cent is this?

b. What part of his salary does Mr. Lane plan to spend for rent? What per cent is spent for rent?

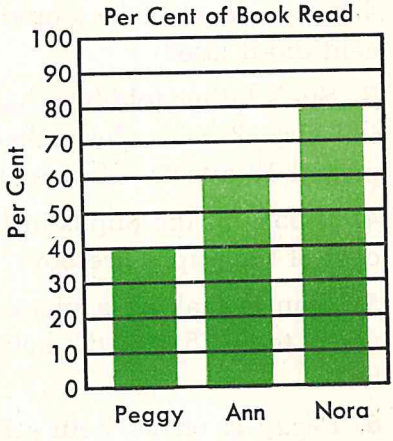
c. What fraction of his salary must be spent for food? What per cent must go for food?

d. What fraction of his salary is to be spent for clothing? What per cent is spent for clothing?

e. What fraction of Mr. Lane's salary is to buy the other things his family needs? What per cent is this?

f. What per cent of Mr. Lane's salary can he save?

5. Peggy, Ann, and Nora are all reading the same book.



a. What per cent of the book has Peggy read?

b. What per cent of the book has Ann read?

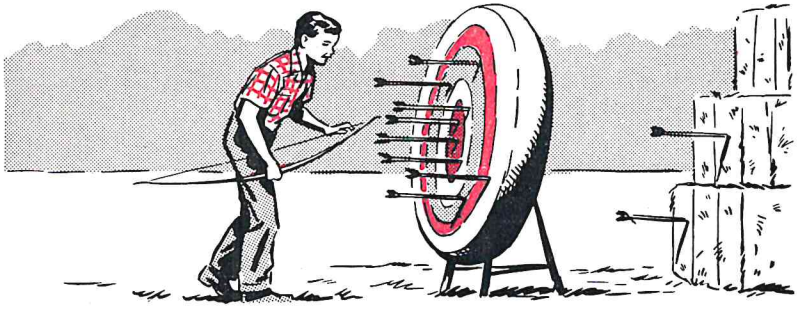
c. What per cent has Nora read?

d. There are 250 pages in the book. 40% is the same as what fraction? Then how many pages has Peggy read?

e. What fraction of the book has Ann read? How many pages has she read?

f. What fraction of the book has Nora read? How many pages has Nora read?

Using Per Cents



These problems will help you understand how per cents are used. See how many you can work as quickies.

1. Sam shot ten arrows at a target. Eight arrows hit the target. What per cent of the arrows hit? What per cent of the arrows missed?

2. A baseball team played 10 games, and won 7 of them. What per cent of its games did the team win? What per cent did it lose?

3. Sue's father told her that he would give her 40% of all the strawberries she picked for him. This morning she picked 10 quarts. How many of these were her share?

4. If 55% of the pupils in Bill's school are girls, what per cent of the pupils are boys?

5. Jean is making a picture 28 in. high. She wants the width to be 75% of the height. How wide will the picture be?

6. Peggy is on an hour's horseback ride. She has been riding for 15 minutes. What per cent of her time is gone?

7. Peggy's father says he will give her $3 toward the cost of a $15 riding outfit she wants to buy. What per cent of the cost will he pay? What per cent must Peggy pay?

8. Mrs. Gray wants a new washing machine that costs $200. She plans to pay 25% of the cost when she buys the machine, and the rest in monthly payments. How much will she have to pay when she buys the machine? What per cent will she still have to pay?

9. Bill has been practicing the high jump. One day he cleared the bar in 6 out of 8 tries. What per cent of his tries were successful?

10. Near the end of the summer, swim suits were sold at a reduction of 40%. How much would Peggy save if she got a swim suit that had been $5?

11. Ellen had 15 boxes of Girl Scout cookies to sell. She has already sold 9 of them. What per cent of her cookies has she sold?

12. Our team is playing 16 baseball games this year. We hope to win 75% of them. How many games would this be?

13. How much must Ken pay for a $5 pair of shoes on sale for 10% off?

14. Don set out 300 strawberry plants. Thirty of them died. What per cent of the 300 plants lived?

15. Allen took 2 rolls of pictures with his camera. There were 10 pictures in each roll. Four of the pictures were spoiled. What per cent of the pictures were good?

16. Dick bought some boards for $9 and made a table which he sold for $12. What per cent of the selling price went for the lumber? What per cent did Dick get for making the table?

17. Jean is making favors for a party her class is giving. She has finished 8 favors and has 12 to make. What per cent of the favors does she still have to make?

Pages 310 and 311 provide enrichment material which can be used after this page.

Are You Sure of Addition?

These examples will help you make sure of your skill in adding different kinds of numbers. Check every answer.

Can you add whole numbers and money numbers?

	a	*b*	*c*	*d*	*e*
1.	137	3449	62708	$2.00	$ 54.78
	76	590	44687	.85	367.30
	645	285	276	9.93	4.05
	4	93	8036	.19	57.33
	741	5758	13659	7.03	448.95

Can you add fractions and mixed numbers?

2.	$1\frac{1}{2}$	$3\frac{4}{5}$	$2\frac{2}{3}$	$2\frac{5}{8}$	$8\frac{1}{4}$
	$\frac{7}{8}$	$1\frac{1}{2}$	1	$6\frac{3}{4}$	$2\frac{7}{10}$
	$2\frac{3}{4}$	$\frac{9}{10}$	$2\frac{3}{4}$	$2\frac{5}{16}$	$3\frac{3}{5}$

Can you add decimals?

3.	.9	7.6	.530	30.43	7.667
	.8	32.8	3.528	8.17	21.929
	.1	9.0	.401	.56	.333
	.7	124.5	1.097	60.97	38.225
	.5	.9	.912	7.00	4.986

Can you add measures?

	a	*b*	*c*
4.	6 ft. 6 in.	3 lb. 14 oz.	7 hr. 52 min.
	5 ft. 7 in.	7 lb. 9 oz.	8 hr. 9 min.
	5 ft. 11 in.	4 lb. 8 oz.	8 hr. 47 min.

Can you copy in columns and add?

5. $3.77 + 86¢ + $26 + $7.79 + $46.85

6. 13.105 + 4.663 + .986 + 3.527 + 34.524

7. $11 + 4\frac{5}{8} + 3\frac{1}{8} + 3\frac{3}{4} + \frac{7}{8} + 6\frac{1}{2}$

Are You Sure of Subtraction?

This page will show you how much you have learned about subtraction. Be sure to check all your work.

Can you subtract whole numbers?

	a	b	c	d	e
1.	$\begin{array}{r} 100 \\ 67 \\ \hline \end{array}$	$\begin{array}{r} 632 \\ 579 \\ \hline \end{array}$	$\begin{array}{r} 1619 \\ 863 \\ \hline \end{array}$	$\begin{array}{r} 7014 \\ 2845 \\ \hline \end{array}$	$\begin{array}{r} 30936 \\ 6880 \\ \hline \end{array}$

Can you subtract decimal money numbers?

2.	$\begin{array}{r} \$1.25 \\ .97 \\ \hline \end{array}$	$\begin{array}{r} \$17.10 \\ 9.20 \\ \hline \end{array}$	$\begin{array}{r} \$41.00 \\ 13.75 \\ \hline \end{array}$	$\begin{array}{r} \$150.08 \\ 90.15 \\ \hline \end{array}$	$\begin{array}{r} \$8425.46 \\ 3584.67 \\ \hline \end{array}$

Can you subtract fractions and mixed numbers?

3.	$\begin{array}{r} \frac{5}{8} \\ \frac{1}{4} \\ \hline \end{array}$	$\begin{array}{r} \frac{3}{4} \\ \frac{2}{5} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{1}{2} \\ 1\frac{5}{6} \\ \hline \end{array}$	$\begin{array}{r} 9\frac{3}{10} \\ 6\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{7}{8} \\ 2\frac{9}{16} \\ \hline \end{array}$
4.	$\begin{array}{r} 10\frac{1}{4} \\ 4\frac{7}{12} \\ \hline \end{array}$	$\begin{array}{r} 16\frac{2}{3} \\ 9\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 24\frac{1}{2} \\ 16\frac{2}{5} \\ \hline \end{array}$	$\begin{array}{r} 40\frac{1}{4} \\ 24\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 12\frac{5}{8} \\ 8\frac{9}{10} \\ \hline \end{array}$

Can you subtract decimals?

5.	$\begin{array}{r} 1.3 \\ .7 \\ \hline \end{array}$	$\begin{array}{r} 9.92 \\ 3.93 \\ \hline \end{array}$	$\begin{array}{r} 136.0 \\ 43.9 \\ \hline \end{array}$	$\begin{array}{r} 72.082 \\ 43.275 \\ \hline \end{array}$	$\begin{array}{r} 57947.5 \\ 38149.0 \\ \hline \end{array}$

Can you subtract measures?

	a	b	c
6.	5 gal. 2 gal. 1 qt.	3 tons 500 lb. 1 ton 1750 lb.	5 min. 5 sec. 4 min. 48 sec.

Can you copy and subtract?

7.	$\$5 - \$1.98$	$8.3 - 5.9$	$10\frac{1}{4} - 2\frac{5}{8}$
8.	$12.48 - 7.80$	$6 - 4\frac{5}{12}$	$17461 - 8365$
9.	$1.022 - .162$	$15\frac{1}{2} - 7\frac{3}{5}$	$7479.1 - 6907.4$
10.	$263\frac{3}{10} - 195\frac{9}{10}$	$\$3.12 - 89¢$	$14.060 - 6.585$

Are You Sure of Multiplication?

Work the following examples to make sure you know how to multiply various kinds of numbers. Check all your work. Are all your answers reasonable?

Can you multiply whole numbers?

	a	b	c	d	e
1.	68 × 45	309 × 70	480 × 192	3287 × 68	1465 × 306

Can you multiply decimal money numbers?

2.	\$.75 × 4	\$3.60 × 20	\$1.79 × 95	\$7.08 × 3 07	\$29.84 × 84

Can you multiply by mixed numbers?

3.	92 × $3\frac{1}{2}$	36 × $9\frac{3}{4}$	56 × $17\frac{3}{8}$	\$1.56 × $8\frac{1}{4}$	\$23.60 × $5\frac{4}{5}$

Can you multiply decimals?

4.	74 × .5	908 × .06	17.9 × 2.7	397 × .01	.62 × .7
5.	9.3 × 3.4	50.6 × 10.9	\$86.00 × .05	\$1.50 × 8.4	\$9.25 × 9.2

Can you multiply measures?

	a	b	c
6.	2 lb. 6 oz. × 6	6 yd. 2 ft. × 4	2 hr. 35 min. × 5

Can you multiply fractions and mixed numbers?

	a	b	c	d
7.	$\frac{2}{3} \times 15$	$6 \times \frac{3}{4}$	$\frac{3}{5} \times \frac{5}{8}$	$\frac{3}{10} \times 5\frac{1}{3}$
8.	$2\frac{1}{2} \times \frac{4}{5}$	$10 \times 2\frac{1}{4}$	$6\frac{2}{3} \times 9$	$3\frac{1}{3} \times 7\frac{1}{2}$

Are You Sure of Division?

See how well you can divide different kinds of numbers. Check all your answers by multiplying.

Can you divide whole numbers?

	a	b	c	d
1.	$9\overline{)3384}$	$64\overline{)576}$	$29\overline{)2175}$	$35\overline{)9730}$
2.	$76\overline{)46284}$	$14\overline{)13313}$	$500\overline{)40000}$	$426\overline{)16188}$

Can you divide decimal money numbers?

3.	$8\overline{)\$6.00}$	$15\overline{)\$7.20}$	$94\overline{)\$7.52}$	$45\overline{)\$22.05}$
4.	$67\overline{)\$414.06}$	$55\overline{)\$169.95}$	$80\overline{)\$384.50}$	$365\overline{)\$616.85}$

Can you divide decimals?

5.	$2.5 \div 10$	$16.67 \div 10$	$87.5 \div 100$	$\$43.00 \div 100$
6.	$7\overline{)5.18}$	$9\overline{)40.5}$	$6\overline{)26.25}$	$25\overline{)9.5}$
7.	$.5\overline{)23}$	$.4\overline{).68}$	$7.2\overline{)57.6}$	$\$.36\overline{)\$5.76}$

Can you divide to the nearest tenth?

8.	$3\overline{)10.6}$	$9\overline{)2.61}$	$4\overline{)27.1}$	$23\overline{)15.9}$

Can you divide to the nearest hundredth?

9.	$7\overline{)37}$	$8\overline{)77.1}$	$6\overline{)\$17.84}$	$23\overline{)\$55.80}$

Can you divide fractions and mixed numbers.

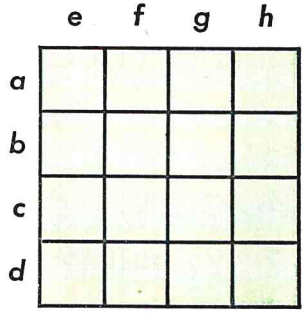
10.	$6 \div \frac{2}{3}$	$7\frac{1}{2} \div \frac{3}{4}$	$\frac{9}{10} \div \frac{3}{10}$	$\frac{3}{4} \div 2$
11.	$8\frac{2}{5} \div 3$	$10 \div 2\frac{1}{2}$	$\frac{15}{16} \div 1\frac{1}{4}$	$6\frac{2}{3} \div 3\frac{1}{3}$

Can you divide measures?

	a	b	c
12.	$4\overline{)10 \text{ ft. } 6 \text{ in}}$	$5\overline{)27 \text{ lb. } 3 \text{ oz.}}$	$3\overline{)14 \text{ hr. } 30 \text{ min.}}$
13.	$8\overline{)99 \text{ yr. } 6 \text{ mo.}}$	$5\overline{)11 \text{ gal. } 1 \text{ qt.}}$	$7\overline{)24 \text{ tons } 1000 \text{ lb.}}$

Cross-Number Puzzles

1. Copy this square. First work Examples *a*, *b*, *c*, and *d* below, and write the answers *across* your square. Check by working Examples e, *f*, *g*, and *h*. Read *down*. Do your answers agree with the numbers already in the puzzle? If not, find your mistake.



Across

a. MDCCXII
b. $.875 \times 4400$
c. $945 \div \frac{1}{5}$
d. Feet in a mile

Down

e. $60071.5 - 58726.5$
f. 64×123
g. $573 \div .375$
h. 50×41

2. Copy the square again and try it with these numbers.

Across

a. Average of 4106, 2372, 987, and 1035
b. Ounces in 243 lb.
c. 1000×1.235
d. Seconds in an hour

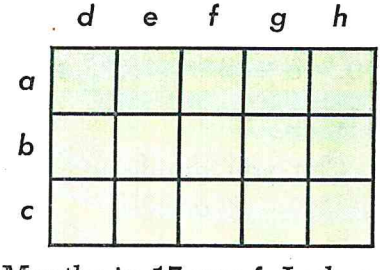
Down

e. $257 \div \frac{1}{9}$
f. MDCCCXXVI
g. $283 \div .1$
h. 100×58.5

3. Copy and fill in this rectangle.

Across

a. Sum of 23490.6 and 8750.4
b. Pounds in 30 tons
c. Difference between 73,527 and 8,769



Down

d. Days in the year 1960; e. Months in 17 yr.; *f*. Inches in $5\frac{3}{4}$ yd.; *g*. Minutes in $6\frac{3}{4}$ hr.; *h*. 9 doz.

Can You Compute?

Diagnostic Check Test 4A

This test will show you how much you have learned about computing with whole numbers, fractions, decimals, and measures. Copy the examples carefully and check all your work.

Copy, add, and check.

	a	*b*	*c*	*d*
1.	76357	7.8	$6\frac{1}{2}$	5 ft. 9 in.
	706	108.5	8	5 ft. 4 in.
	6997	52.4	$5\frac{3}{4}$	4 ft. 8 in.
	39748	81.3	$5\frac{7}{8}$	6 ft. 3 in.

Copy, subtract, and check.

2.	12503	50.4	$7\frac{1}{5}$	8 hr. 30 min.
	9418	20.7	$2\frac{9}{10}$	3 hr. 45 min.
3.	\$175.00	7.280	$9\frac{1}{3}$	5 gal.
	96.25	4.667	$6\frac{1}{2}$	2 gal. 3 qt.

Copy, multiply, and check.

4.	609	17.5	\$3.60	5 lb. 8 oz.
	308	2.9	$2\frac{3}{4}$	5

Copy, divide, and check.

5.	$15\overline{)7350}$	$30\overline{)6240}$	$4.8\overline{)89.6}$	$4\overline{)45 \text{ yr. } 8 \text{ mo.}}$
6.	$25\overline{)\$87.50}$	$\$.53\overline{)\$9.54}$	$.06\overline{)4.5}$	$3\overline{)11 \text{ lb. } 4 \text{ oz.}}$

Copy, work, and check.

	a	*b*	*c*
7.	\$10 − \$7.09	\$3.25 + 98¢	100 × \$.75
8.	3.8 ÷ .01	$1\frac{3}{4} \times 2\frac{2}{3}$	$7 - 2\frac{5}{12}$
9.	6.5 ÷ 15.8	$12 \div \frac{3}{4}$	.06 × \$250
10.	$8\frac{1}{4} \div 2\frac{3}{4}$	.5 × .8	167.5 ÷ 10

Do You Understand Numbers?

Diagnostic Check Test 4B

See how much you know about what numbers mean.

1. Write the number that means 7 hundreds, 8 tens, 3 ones, 1 tenth, 9 hundredths.

2. In the number 8.625, what value has the 2?

3. Round off 38.509 to the nearest hundredth.

4. Change the fraction $\frac{3}{8}$ to decimal thousandths.

5. Find the average of 7.2, 5.8, and 3.5.

6. What Roman number comes between XXXIX and XLI?

7. When you divide 240 by .8, is the quotient larger, or smaller, than 240?

8. When you multiply 32 by .75, is the product larger, or smaller, than 32?

9. Change 4.75 to a mixed number in lowest terms.

10. Which is larger, $\frac{1}{4}$ or .2?

11. Is $\frac{3}{4}$ larger, or smaller, than .8?

12. Arrange 10, .01, 1.0, and 0.1 in the order of their value, the smallest first.

13. Is 3.24 nearer 3.3 or 3.2?

14. 4.8 is how many times as large as .8?

15. What is the area of a rectangle 10 ft. long and 8.5 feet wide?

16. Find the perimeter of a square $8\frac{1}{4}$ in. wide.

17. Twelve is what fractional part of 30?

18. Sixty is $\frac{2}{3}$ of what number?

19. Write the multiplication example you use to check $14.4 \div 6 = 2.4$.

Can You Use Arithmetic?

Diagnostic Check Test 4C

See how well you can use arithmetic in problems.

1. It is now 5:30 p.m. Mother says dinner will be ready in $\frac{3}{4}$ hr. At what time should we come to dinner?

2. Sam caught 8 fish. Their total weight was 17 lb. 8 oz. Find the average weight of the 8 fish.

3. Jerry and Bill were paid $2.25 for mowing a lawn. Jerry worked 2 hours and Bill worked 1 hour. How much should Jerry get for his share of the money?

4. When we started on a 3-day trip, the speedometer on our car read 27809.4 mi. When we finished the trip, our speedometer read 28979.1. To the nearest mile, find how many miles we drove each day on the average.

5. The average annual rainfall in our town is 35.64. What is the average monthly rainfall?

6. Mrs. Lane paid 86¢ for a 4-quart basket of peaches. At this rate, how much would she pay for a bushel?

7. Debby's baby brother weighed 6 lb. 9 oz. at birth. A month later he weighed 8 lb. 1 oz. How many ounces a week had he gained on the average? Use 1 mo. = 4 wk.

8. The ages of four boys were 13 yr. 9 mo., 10 yr. 11 mo., 12 yr., and 11 yr. 8 mo. What was the average age of the boys?

9. From Esmond to Northwood is 86.8 mi. From Esmond to Delmar is 142.3 mi. on the same railroad and in the same direction. How far is it from Northwood to Delmar?

10. Allen paid 18 cents to have a film of 8 pictures developed. He had 2 prints of each picture made at 6 cents a print. How much did he pay in all?

Enrichment Section

Pages 256-311 have some interesting arithmetic for those who especially like arithmetic and who have finished their regular work. A note at the bottom of each page in this section tells just when the page is to be used. For example, pages 256 and 257 are to be used after page 11 has been finished.

Fun With Magic Squares

3	4	1	5	2
2	3	4	1	5
5	2	3	4	1
1	5	2	3	4
4	1	5	2	3

Square I

In a magic square, the numbers all add up to the same sum, no matter in what direction you add them. You can add *across* the rows, you can add *down* the columns, you can add on the *diagonals* from corner to corner.

1. Add the numbers in Square I to see whether it is a magic square.

a. What is the sum of each of the five rows?
b. What is the sum of each of the five columns?
c. What is the sum of each of the two diagonals?
d. Is this a magic square?

2. Add the money numbers in Square II to find out whether this is a magic square.

a. What is the sum of each row?
b. What is the sum of each column?
c. What is the sum of each diagonal?
d. Is Square II a magic square?

30¢	$1.10	60¢
90¢	10¢	$1.00
80¢	80¢	40¢

Square II

Pages 256 and 257 are to be used for enrichment after page 11.

3. Square III is a Roman number square. See if you can add Roman numbers to find out whether this is a magic square.

a. What is the sum of each row?

b. What is the sum of each column?

c. What is the sum of each diagonal?

d. Is this a magic square?

I	XV	XIV	IV
XII	VI	VII	IX
VIII	X	XI	V
XIII	III	II	XVI

Square III

2	30		

Square IV

4. Copy Square IV and make it a magic square by turning the Roman numbers in Square III into our (Arabic) numbers and making each number *twice as large.* The first two numbers in the top row are 2 and 30.

When you have finished your square, add each row, column, and diagonal to see whether you have made a magic square.

5. Square V is a magic square, but some of the numbers have been left out. Copy it and find the missing numbers by adding and subtracting.

What should be the sum of each column, row, and diagonal? Is your square a magic square?

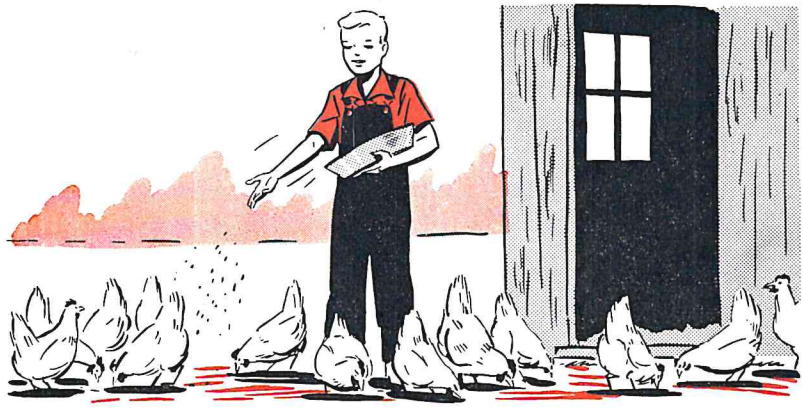
	9	4
7		3
		8

Square V

6. Make another square by adding 5 to each number in Square I on page 256. Is your square a magic square?

Pages 256 and 257 are to be used after page 11.

Raising Chickens



Bob lives in the country. He has been raising chickens for several years now. He hopes to have a poultry farm some day.

Bob sells both eggs and chickens. This year he has a flock of hens to lay eggs. He is raising other chickens to sell.

Here are some of the money problems Bob runs into in raising his chickens and selling his eggs and chickens.

1. Bob sold a dozen eggs and a chicken to Mrs. Smith. The eggs were 64 cents and the chicken was $1.76. How much did he get for both?

2. Mrs. Smith gave Bob a five dollar bill. How much change should Bob give her? What pieces of money should he give her?

3. Bob keeps a careful account of all the money he takes in and spends. One week, he sold eggs for $9.96 and chickens for $4.07. How much more did he get from his eggs than from the chickens he sold? How much money did he take in that week in all?

Pages 258 and 259 are to be used after page 17.

Number Magic

You can play some queer tricks with our number system. Here is a magic number trick you can try on your friends. Tell someone, "Write any three-figure number you like without my seeing it. Now *reverse* the number—that is, write the figures in the opposite order. If your number is 371, the reverse number is 173. *Subtract* whichever number is smaller from the larger number. When you get this remainder, reverse the remainder and *add* it to the remainder. I'll tell you the sum!" The sum will always be 1089 if the work is correct.

A good magician always tries out his magic first to be sure it works. Let's try the number 492.

1. What is the reverse of 492?

2. Subtract it from 492. What is the remainder?

3. What is the reverse of your remainder?

4. Add it to your remainder. What is the sum? If it isn't 1089, look for the mistake in your arithmetic.

Try out this trick again with some other three-figure numbers of your own choice to make sure you can work the trick. Each number should have 3 different figures.

Pages 268 and 269 are to be used after page 49.

Problems With Dates

1. October 12 is Columbus Day because Columbus first saw the New World on October 12, 1492. He died May 20, 1506. Can you find how many years, months, and days Columbus lived after he discovered America?

You must subtract October 12, 1492 from May 20, 1506. To do this, you need to write dates the short way. May 20, 1506 is written 5/20/1506 because May is the fifth month of the year. Why is October 12, 1492 written 10/12/1492?

Year	Month	Day
1506	5	20
1492	10	12
13	7	8

See how the two dates are written in the box at the left. You can subtract 12 days from 20 days, but you can't take 10 months from 5 months. You will have to do some borrowing. *Borrow 12 months* from the year 1506. Do you see how to do the rest of the subtraction? How long did Columbus live after he discovered America?

You can check the answer by addition. Add the answer to the date Columbus discovered America. Is the sum equal to the date he died?

Pages 260 and 261 are to be used after page 23.

2. Linda was born September 8, 1940. On January 1, 1953, she wanted to find just how old she was.

Year	Month	Day
1953	1	1
1940	9	8
12	3	23

When you subtract, you have to borrow twice. See if you can borrow in your head. First, you borrow *30 days* from the month column, and add 30 days to the 1 day you have. Subtract 8 from 31.

Then you must borrow 12 months from the year column, and subtract 9 from 12.

How old was Linda? Check the answer.

3. An American, Admiral Robert E. Peary, discovered the North Pole on April 4, 1909. A Norwegian explorer, Captain Roald Amundsen, discovered the South Pole Dec. 14, 1911. How long was it between these two discoveries?

4. Tom read that the first settlers came to his city on April 15, 1819. The first railroad came there May 8, 1847. How long after the founding of the city did the railroad come?

5. On July 4, 1951, Mr. Lane said, "Jean, we moved into this house on October 18, 1945. How long have we lived here?" What should Jean have answered?

6. The farm Bob lives on was bought by Grandfather Gray on February 20, 1896. The Gray family has lived there ever since. Bob was born on Jan. 1, 1941. How long had the Grays been living on their farm when Bob was born?

7. The Declaration of Independence was signed July 4, 1776. How long ago was that?

8. Subtract your birth date from the date today. How old are you?

Pages 260 and 261 are to be used after page 23.

How Many People?

Tom was studying some of the larger countries in North and South America. He found the following figures for the area and population of these countries.

Country	*Area in Square Miles*	*Population*
Argentina	1,078,769	17,641,000
Brazil	3,288,000	52,619,000
Canada	3,845,774	14,009,000
Chile	286,396	5,916,000
Colombia	439,997	11,260,000
Ecuador	175,830	3,077,000
Mexico	760,383	26,332,000
Peru	514,059	8,558,000
United States	3,022,387	157,269,000
Venezuela	352,150	4,986,000

1. Copy Tom's table, writing the area of each country to the *nearest hundred thousand* square miles. (A square mile is the amount of land in a square that is a mile on each side.) For Argentina, this will be 1,100,000.

2. In the table, write the population of each country to the *nearest million.*

Use your table to answer the following questions.

3. About how much larger is Canada than the United States in area? What other country in this list, combined with the United States, would have an area about equal to Canada's?

4. About how many times as many people live in the United States as in Canada?

Pages 262 and 263 are to be used after page 27.

5. What South American country is nearest to the United States in size?

6. How many more people live in the United States than in Canada and Mexico combined?

7. Tom read that there are approximately 110,400,000 people in South America. About what fraction of these people live in Brazil?

8. What South American country is about half the size of Argentina? Approximately what fraction of Argentina's population does this country have?

9. Add the populations of Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. About how many million less people live in all these countries combined than live in the United States?

10. Divide 157 million, the population of the United States, by 3,000,000 square miles, its area. About how many people per square mile is this, on the average?

11. If you take Argentina's area as approximately a million square miles, and its population as 18,000,000 people, about how many people are there per square mile in Argentina? How many less people are there per square mile in Argentina than in the United States?

12. List the countries in Tom's table in order of the size of their areas, the largest first. The largest country is how many times as large as the smallest?

13. List the countries in order of the size of their populations, the smallest first. Which country has a population about three times that of Chile's? Which country has a population about half as large as the population of Argentina?

Pages 262 and 263 are to be used after page 27.

Jerry's Stamps

Both Jerry and his father are stamp collectors. Jerry belongs to a stamp club at his school. This year, there are 17 boys in the club. They often have arithmetic problems to solve in buying and trading stamps.

1. Fourteen of the boys in Jerry's stamp club sent off for sets of United States National Park stamps. The sets cost 35 cents apiece. How much money did they have to send for the stamps?

2. Jerry is treasurer of the club. Last week, he collected 24 cents apiece from each of the boys in the club to buy a new issue of stamps at the post office. How much did Jerry collect?

3. Jerry wants to complete his set of Famous Americans. He needs 19 more stamps, and can get them for an average cost of 18 cents per stamp. How much will it cost him to complete his set?

4. Jerry needs one stamp to complete another set. This stamp costs $2.25 if new or only 45¢ if canceled. How much less is the stamp worth if it has been canceled?

Pages 264 and 265 are to be used after page 37.

5. Another stamp that Jerry wants costs $3.25 new or 75¢ canceled. How much more is this stamp worth if it has not been canceled?

6. Different kinds of stamps were advertised in mixed packets for 55 cents a packet. If each of the 17 boys brought the money for one packet, how much was collected for all the packets?

7. There were 200 stamps in each packet. The boys decided to put all the stamps together. How many stamps did they have?

8. One day, Jerry and his father went to a stamp auction. Jerry's father bought 15 sheets of stamps for $1.65 a sheet. How much did he pay for all the sheets?

9. At a stamp dealer's, Jerry and his father saw a set of rare United States stamps. Four of the stamps in the set were $200 apiece; 2 were $300 apiece, 4 were $500 apiece; one was $600; and one was $2,000. How much was this set of rare stamps worth?

10. Jerry's father has 6,523 stamps in his stamp album. Jerry has 2,907 in his album. How many stamps are there in both albums?

11. How many more stamps are there in the collection of Jerry's father than in Jerry's?

12. Besides the stamps in his album, Jerry keeps extra stamps in his trading book. He has trading stamps on 49 pages, with an average of 16 stamps on a page. About how many stamps does Jerry have for trading?

You have to use multiplication to solve most of these problems. In which problem did you use both multiplication and addition? In which other problem did you use addition? In which three problems did you use subtraction?

Pages 264 and 265 are to be used after page 37.

What's the Number?

Can you find all the missing numbers on this page? Think whether you add, subtract, multiply, or divide to find each number.

1. What number do you add to 7 to get 12?

2. What number do you subtract from 16 to get 9?

3. What number do you multiply by 6 to get 30?

4. What number do you divide by 7 to get 5?

5. What number is one seventh of 63?

6. If 15 is added to a certain number, the sum is 23. What is the number?

7. If 8 is subtracted from a certain number, the remainder is 5. What is the number?

8. If 9 is multiplied by a certain number, the product is 36. What is the number?

9. If 48 is divided by a certain number, the quotient is 6. What is the number?

10. If a certain number is subtracted from 40, the remainder is 25. What is the number?

11. If a certain number is divided by 9, the quotient is 6. What is the number?

Copy these examples and fill in the missing numbers.

	a	*b*	*c*
12.	$17 + ? = 25$	$40 - ? = 28$	$7 \times ? = 70$
13.	$63 \div ? = 9$	$? + 12 = 36$	$? - 6 = 24$
14.	$? \times 12 = 48$	$? \div 5 = 10$	$23 - ? = 0$
15.	$63 + ? = 100$	$? - 48 = 100$	$? \div 30 = 9$

This page is to be used after page 44.

Write Your Own Questions

Some of the problem situations below are division situations and some are multiplication situations. Decide which kind of problem each one should be, and write the right question for it. Then work the problem and write the answer on your paper.

1. Mr. Lane needs 9 gallons of gasoline to fill the tank of his car. Gasoline costs 27 cents a gallon.

2. Don found that a large basket of peaches held 64 peaches and a small basket held 16 peaches.

3. Sam's father bought 3 new tires for his car. He paid $57.50 in all for them.

4. At her father's road stand one day, Jill sold 18 bunches of dahlias at 75 cents a bunch.

5. From Chicago to Denver is 1026 miles by railroad. A fast train makes this trip in 15 hours.

6. Two hundred seventy-five people are coming to our school picnic. One cake can be cut into 16 pieces.

7. Last month, Don worked 26 hours in the orchard for his father. His father paid him 45 cents an hour.

8. On a recent trip, Mr. Lane went 486 miles and used 27 gallons of gasoline.

9. Thirty-six people went on a trip in a bus. The cost for the bus was $52.20.

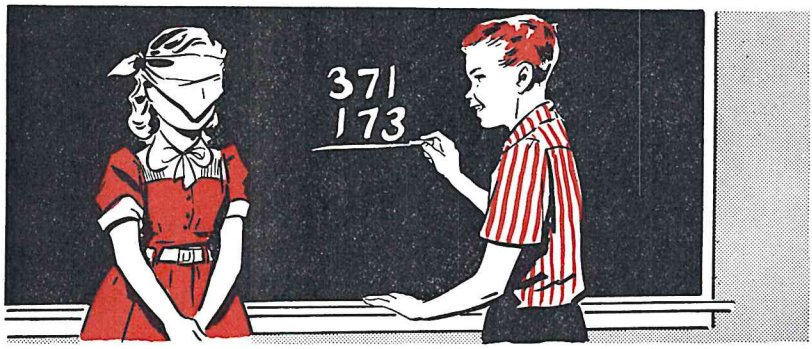
10. Jerry bought a set of 11 stamps for $1.65.

11. The gasoline tank in our car holds 16 gallons of gasoline. One gallon of gasoline will take us 18 miles.

12. Kathy rides 27 miles in the school bus every day she is in school. She was in school 19 days last month.

This page is to be used after page 47.

Number Magic



You can play some queer tricks with our number system. Here is a magic number trick you can try on your friends. Tell someone, "Write any three-figure number you like without my seeing it. Now *reverse* the number—that is, write the figures in the opposite order. If your number is 371, the reverse number is 173. *Subtract* whichever number is smaller from the larger number. When you get this remainder, reverse the remainder and *add* it to the remainder. I'll tell you the sum!" The sum will always be 1089 if the work is correct.

A good magician always tries out his magic first to be sure it works. Let's try the number 492.

1. What is the reverse of 492?

2. Subtract it from 492. What is the remainder?

3. What is the reverse of your remainder?

4. Add it to your remainder. What is the sum? If it isn't 1089, look for the mistake in your arithmetic.

Try out this trick again with some other three-figure numbers of your own choice to make sure you can work the trick. Each number should have 3 different figures.

Pages 268 and 269 are to be used after page 49.

Two More Magic Tricks

Here are two more number tricks which you can try on your friends or use at a party.

Trick I. Say, "Write down your age in years. *Multiply* it by 2. *Subtract* 3. *Multiply* by 50. *Add* 39. Now *add* the amount of change you have, less than $1. (Any number of cents less than 100 will do.) Tell me your total. I'll tell you how old you are and how much change you have!"

To find out, you just add 111 to his total. The first 1 or 2 figures are his age; the other figures are the change.

Let's practice this trick with 13 as the age.

1. Multiply 13 by 2. What is the product?
2. Subtract 3. What is the remainder?
3. Multiply by 50. What is the product?
4. Add 39. What is the sum?
5. Add 47 (as the amount of change). What is the total?

Now add 111 to the total. Your answer should be 1347.

Try the trick again with a one-figure age and a one-figure number of cents. Then try it with a larger number for the age, so you will know how to work the trick on your parents!

Trick II. Have someone write any three-figure number and repeat it, so that it becomes a six-figure number. (For instance, 275 would become 275,275.)

Tell the next person to divide this number by 11. Another person divides the quotient by 7. Last of all, somebody divides this quotient by 13.

The answer is always the three-figure number you began with!

Practice this one several times. Does it always work?

Pages 268 and 269 are to be used after page 49.

Estimating the Cost of a Trip

The Lanes planned a week-end automobile trip they were going to take. In order to estimate how much the trip would cost, they had to estimate the distance they would drive. They also wanted to estimate how long the trip would take.

The first seven problems show how the Lanes did their estimating. See if you can solve some of these problems as quickies.

1. With the help of a road map, they estimated the distance from their home to Great Cave as 150 miles. About how many miles would the round trip be?

2. They expected to go about 18 miles on each gallon of gasoline. About how many gallons of gasoline would they use?

3. They estimated the cost of the gasoline at 25 cents per gallon. About how much would they pay for gasoline?

4. If they averaged 30 miles per hour on the whole trip, how many hours of driving time would the trip take?

5. They planned to stay one night at a motel. If the motel charged $4 per person, how much would they pay for the family? (4 persons)

6. They were going to leave on Saturday morning and return on Sunday afternoon. They would carry their Saturday lunch, so they planned to buy only three meals during the trip. If each meal cost $1.25 per person on the average, how much would they spend for meals?

7. They allowed $2.50 a person for all other expenses. How much would these other expenses amount to?

Pages 270 and 271 are to be used after page 53.

When the Lanes made the trip, they kept a careful record of the actual distances and costs.

8. At the beginning of the trip, the speedometer read 10607. At the end of the trip, the reading was 10940. How many miles did they drive? Compare this distance with the estimate in Problem 1. How many miles more or less than the estimate was the actual distance?

9. They used 18 gallons of gasoline. How many miles per gallon did they average?

10. They bought 10 gallons of gasoline at 26 cents a gallon and 8 gallons at 24 cents a gallon. How much did they spend for gasoline?

11. Their actual driving time was 10 hours. How many miles per hour did they average? Compare this with the estimated speed in problem 4.

12. Their overnight stay at the motel cost $14.60. How much was this per person?

13. They spent $6.25 for their suppers, $3.40 for their breakfasts, and $7.35 for their Sunday dinners. How much did they spend for all their meals? How much was this per person?

14. Their other expenses were $1.50 for souvenirs for Jean and Tony, 40 cents for oil for the car, $1 for fixing a tire, and 80 cents for ice cream cones. How much did these other expenses amount to?

15. Make a table of the estimated costs in Problems 3, 5, 6, and 7. How much did the Lanes estimate the trip would cost altogether?

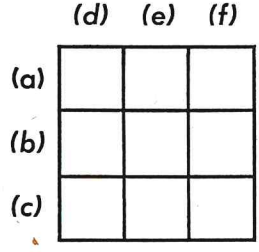
16. Make another table of the actual costs in Problems 10, 12, 13, and 14. How much did the trip actually cost?

17. Compare the actual cost with the estimated cost.

Pages 270 and 271 are to be used after page 53.

Cross-Number Squares

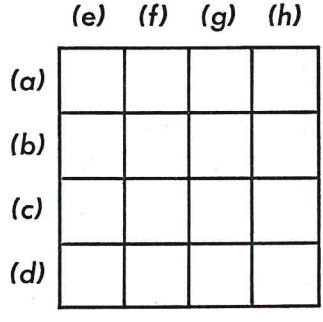
Do you know how to work cross-number squares? They are very much like crossword puzzles, but you use numbers instead of words.



1. On your paper, copy the square at the left. First work the three following examples marked Across and write the answers in the spaces across your square. Then do the examples marked Down. If your work is correct, your answers *down* will check the answers you have already written *across* the square.

Across: *(a)* 22852 ÷ 58 *(b)* 17 × 49 *(c)* 42081 ÷ 83

Down: *(d)* 1076 — 691 *(e)* 485 + 445 *(f)* 21200 — 20763



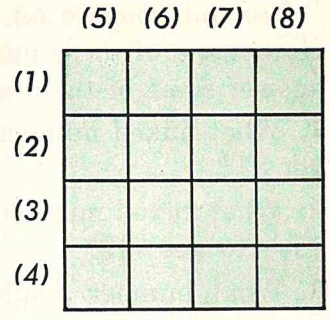
2. Copy on your paper the square at the left. Fill the square by working the four examples below marked Across and writing the answers across the square. Then work the four examples marked Down and see if they agree with the numbers you have written. If your answers *down* don't check your answers *across*, find out where you made your mistake.

Across	Down
(a) 69888 ÷ 12	*(e)* 10000 — 4172
(b) 26 × 309	*(f)* 2709 + 5356
(c) 80850 ÷ 30	*(g)* 8 × 299
(d) 87 × 98	*(h)* 44560 ÷ 10

Pages 272 and 273 are to be used after page 68.

A Problem Puzzle

Here is a cross-number square which you fill in by solving problems. Copy the square on your paper. Work the problems below and write your answers in the square. Write the answers to Problems 1, 2, 3, and 4 *across* the square. The answers to Problems 5, 6, 7, and 8 *down* should check the answers across.



1. Linda's father drives 39 miles every day he goes to his office. Last year he went to his office 238 days. How many miles did he drive?

2. In 8 months, Mr. Lane drove 12,872 miles. How many miles a month did he average?

3. Jill read that Mt. McKinley, the highest mountain in North America, is 20,257 ft. high. Mt. Everest, the highest mountain in the world, is 29,002 ft. high. How much higher is Everest than McKinley?

4. A school cafeteria serves an average of 275 lunches a day. How many lunches will it serve in 19 school days?

5. In ten years, the population of Bill's city increased from 197,429 to 206,614. How much was the increase?

6. Sam's father drove his car 989 miles in March and 1683 miles in April. How far did he drive in both months?

7. On Jan. 1, the speedometer in a car read 59870. Now it reads 67912. How many miles has the car gone this year?

8. One thousand pupils and 1955 grownups saw a high school basketball game. How many people saw the game?

Pages 272 and 273 are to be used after page 68.

A Fraction Quiz Program

Pretend you are on a Fraction Quiz Program on TV. How many of these questions can you answer? Can you answer some of them as quickies?

1. What mixed number would you have to add to $4\frac{3}{4}$ to get $8\frac{1}{4}$?

2. What mixed number would you have to subtract from $15\frac{1}{12}$ to get $7\frac{11}{12}$?

3. What number would you have to subtract $7\frac{4}{5}$ from to get $9\frac{4}{5}$?

4. Which is longer, $\frac{15}{16}$ inch or $\frac{7}{8}$ inch?

5. Which is larger, $\frac{1}{2}$ of 24, or $\frac{3}{4}$ of 12?

6. Sam, Bob, and Don had a doughnut party. Sam ate $3\frac{3}{4}$ doughnuts and Bob ate $4\frac{1}{4}$ doughnuts. If the boys had a dozen doughnuts to start with, and ate them all, how many doughnuts did Don eat?

7. Three shepherds had flocks of sheep. One shepherd had 360 sheep in his flock, the second had $\frac{2}{3}$ as many, and the third had $\frac{3}{4}$ as many. How many sheep were in all three flocks?

8. In Tom's school, three rooms each have 24 pupils. In one room, 3 pupils were absent; in another room, 4 pupils were absent; and in the third room, 2 pupils were absent. What fraction of the pupils in all three rooms were present?

9. One hundred forty-four children went on a picnic. After eating, a third of them played ball, a fourth of them roller-skated, a sixth of them pitched horseshoes, and a twelfth of them played croquet. What fraction of all the children were playing these games?

This page is to be used after page 82.

How Do You Know?

See whether you can answer these questions without using your pencil. Thinking of round numbers will help you.

1. Sam has a collection of 197 box tops. Dick has 89 box tops in his collection. How do you know that together the boys have less than 300 box tops?

2. If ham costs 62 cents a pound, how do you know that a $10\frac{1}{2}$-pound ham must cost more than \$6?

3. If you buy a sweater for \$7.87, how do you know that you should get more than \$2 change from \$10?

4. If a train travels a distance of 993 miles in 20 hours, how do you know it has averaged less than 50 miles per hour?

5. How do you know that the total cost of 6 pairs of socks costing 49 cents a pair must be less than \$3?

6. On a trip of 698 miles, Mr. Lane has driven 72 miles. How do you know that he has gone more than $\frac{1}{10}$ of the distance?

7. Tom has worked for 1 hour and 45 minutes. How do you know that at 40 cents an hour he has earned less than 80 cents?

8. How do you know that the sum of $4\frac{7}{8}$ and $6\frac{3}{4}$ is more than 10?

9. How do you know that $12\frac{3}{4} - 3\frac{3}{16}$ is more than 9?

10. How do you know that there are more than ten 35's in 378?

11. How do you know that 73×84 is more than 5600?

This page is to be used after page 91.

Fun With Magic Squares

You found out about magic squares on pages 256 and 257. See if you can use fractions in magic squares.

$\frac{1}{3}$	$\frac{3}{4}$	$\frac{1}{6}$
$\frac{1}{4}$	$\frac{5}{12}$	$\frac{7}{12}$
$\frac{2}{3}$	$\frac{1}{12}$	$\frac{1}{2}$

Square I

1. Add the fractions in Square I.

a. What is the sum of each row?

b. What is the sum of each column?

c. What is the sum of each diagonal?

d. Is this a magic square?

2. Copy Square II and make it a magic square by filling in the missing numbers. How do you find what the sum of every row, column, and diagonal should be? What is this sum? How do you find the missing number in the top row?

$2\frac{2}{5}$	$\frac{3}{10}$	
	$1\frac{1}{2}$	$2\frac{1}{10}$
$1\frac{1}{5}$		$\frac{3}{5}$

Square II

$\frac{1}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$
$\frac{7}{8}$	$\frac{5}{8}$	$\frac{3}{8}$
$\frac{3}{4}$	$\frac{1}{8}$	1

Square III

3. First test Square III to see whether it is a magic square. What is the sum of every row, column, and diagonal?

Now make another square by adding $\frac{1}{2}$ to each number in Square III. Is your new square a magic square? What is the "magic sum?"

4. Test Square IV to see whether it is a magic square. Are all the sums the same? What is this magic sum?

See if you can make another magic square by subtracting each number in Square IV from 5. Is your square a magic square?

$3\frac{1}{6}$	$4\frac{5}{6}$	$2\frac{1}{2}$
$2\frac{5}{6}$	$3\frac{1}{2}$	$4\frac{1}{6}$
$4\frac{1}{2}$	$2\frac{1}{6}$	$3\frac{5}{6}$

Square IV

Pages 276 and 277 are to be used after page 99.

5. Copy Square V on your paper, and fill it in with the answers to the following examples. Write each answer in the space indicated by the number of the example.

(1)	(2)	(3)
(4)	(5)	(6)
(7)	(8)	(9)

Square V

(1) $9 - 8\frac{1}{4}$ (5) $2\frac{5}{8} - \frac{3}{4}$

(2) $1\frac{1}{2} + 1\frac{7}{8}$ (6) $\frac{2}{3} + \frac{11}{24}$

(3) $4\frac{2}{3} - 3\frac{1}{6}$ (7) $4\frac{3}{16} - 1\frac{15}{16}$

(4) $3\frac{22}{24} - 1\frac{7}{24}$ (8) $\frac{1}{16} + \frac{5}{16}$ (9) $1\frac{7}{12} + 1\frac{5}{12}$

Now test your square by adding your answers.

a. What is the sum of each row?

b. What is the sum of each column?

c. What is the sum of each diagonal?

d. Is your square a magic square?

$\frac{3}{4}$	$1\frac{11}{12}$	$1\frac{5}{6}$	1
$1\frac{2}{3}$	$1\frac{1}{6}$	$1\frac{1}{4}$	$1\frac{5}{12}$
$1\frac{1}{3}$	$1\frac{1}{2}$	$1\frac{7}{12}$	$1\frac{1}{12}$
$1\frac{3}{4}$	$\frac{11}{12}$	$\frac{5}{6}$	2

Square VI

6. See if you can test a larger square like Square VI.

a. What is the sum of each row?

b. What is the sum of each column?

c. What is the sum of each diagonal?

d. Is this a magic square?

7. Copy Square VII and make it a magic square.

a. What is the "magic sum?"

b. What fraction goes in space *(1)*?

c. What mixed number goes in *(2)*?

d. What mixed number goes in *(3)*?

e. What whole number goes in *(4)*?

f. Is your square a magic square?

$1\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{5}{8}$	(1)
(2)	$1\frac{5}{8}$	(3)	$2\frac{1}{4}$
$1\frac{3}{8}$	$2\frac{1}{8}$	2	$1\frac{3}{4}$
$2\frac{3}{4}$	(4)	$1\frac{1}{8}$	$2\frac{3}{8}$

Square VII

Pages 276 and 277 are to be used after page 99.

Problems a Century Old

The problems on this page were in an arithmetic book printed one hundred years ago. See if you can solve the problems boys and girls had to work a century ago.

1. Thomas said he counted 283 crows in his father's cornfield. He threw a stone and scared 129 away. How many then remained?

2. There are 16536 letters in a book. How many letters are there in 495 of the same books?

3. William lends his brother 3275 cents, his sister 4287 cents, his father 3851 cents, and has 4897 cents left. How much money had he?

4. In one bushel there are 32 quarts. How many bushels are there in 16182 quarts?

5. If 200 acres of corn can be hoed by 157 boys in 19 days, how long would it take one boy to do it?

6. Emma's doll and its little cradle cost 320 cents and the doll cost 95 cents. How much did the cradle cost?

7. Peter's kite arose 436 feet, and Andrew's kite went 57 feet higher. How high did Andrew's kite arise?

8. A drover bought 4898 pigs at 9 dollars each. What did they cost?

9. Mary's new reader contains 78 pictures, and Fanny's contains 94 pictures. How many more does Fanny's contain than Mary's?

10. The income of a man who "struck oil" is 400 dollars per day. How many teachers would this income for one year employ at a salary of 730 dollars a year?

This page is to be used after page 103.

Write the Right Question

Sometimes problems are more fun when you write your own questions for them. Read each problem situation carefully. Then see if you can write the kind of question called for (addition, subtraction, multiplication, division) to complete the problem. Then work the problem.

These are all two-step problems. Remember, to solve them, you must find and answer the hidden question first.

1. Bill bought 3 softballs at a sporting goods store for $1.49 apiece. The next week, at a sale, these balls were advertised at 3 for $3.85. (Write a subtraction question.)

2. Thirteen pupils from Miss Brown's room, 21 pupils from Miss White's room, and 19 pupils from Mr. Hudson's room are going on a trip. The cost is $1.10 apiece. (Write a multiplication question.)

3. Sally bought 3 yards of cotton goods for 69 cents a yard, and a remnant of silk for $2.45. (Write a subtraction question.)

4. At the beginning of a trip, the Lanes' speedometer read 11507, and at the end of the trip it read 11754. On the trip, the Lanes used 15 gallons of gasoline. (Write a division question.)

5. For a month, Tom kept track of the money he spent. The first week, he spent $2.05; the second week, $1.89; the third week, $2.59; and the fourth week, $3.23. (Write a division question.)

6. For his club, Jerry ordered 12 packets of stamps with 135 stamps in each one, and another packet containing 250 stamps. (Write an addition question.)

This page is to be used after page 109.

Making Up Two-Step Problems

See if you can make up a two-step problem about each of the following situations. Be sure you can work your problems, then exchange problems with a classmate.

1. Make up a two-step problem about buying two things and getting change from the clerk.

2. Make up a two-step problem about how much money you earned by working several hours last week and several hours this week.

3. Make up a two-step problem about how much money you will have left after buying several cupcakes.

4. Make up a two-step problem about how much each boy must pay when several boys share the cost of buying several baseballs. (Make the answer come out exactly.)

5. Make up a two-step problem about the average height of several boys. (Make your answer come out exactly.)

6. Make up a two-step problem about how many pounds a year you have gained on an average in the last three years.

7. Make up a two-step problem about how many more girls than boys there are in a school. (Use subtraction twice.)

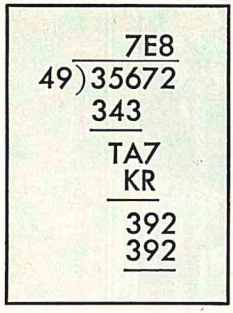
8. Make up a two-step problem about buying two pieces of cloth and using some of the cloth.

9. Make up a two-step problem about the total cost of a layer cake and several pounds of sugar.

10. Make up a two-step problem about the average number of miles per day your family drove on a three-day trip.

This page is to be used after page 112.

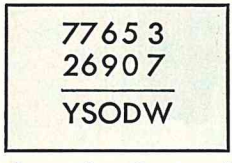
Letter Arithmetic



The examples below are like puzzles. After working these, perhaps you'll make up some of your own!

1. In this division example, some letters have been used in place of numbers. Each letter stands for one figure.

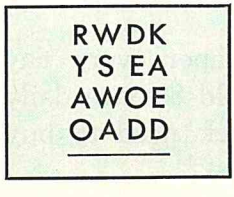
Work the example and find what figure the letter T stands for. What figure does A stand for? What does E stand for? K? R?



2. In the subtraction example at the left, what figure does the letter W represent? The letter D? The letter O? What does the S stand for? The Y?

3. Arrange the ten letters whose values you have found in the order of the figures they represent, from 0 to 9. When you arrange the letters in this way, they will spell two words—something that brings results!

4. In the multiplication example at the left, the letters stand for the same figures they represented in Examples 1 and 2. Substitute for each letter the figure it represents and find the product. Write it in figures first. Then see if you can write it in letters.



5. See whether you can work the addition example at the left in the same way. First substitute for the letters the figures they represent. Then add. What is the sum in figures? What is it in letters?

This page is to be used after page 119.

Jacks's Paper Route

Tom and his friend Jack both have newspaper routes. They carry different newspapers. Jack has 56 customers on his route. All 56 of them take the daily paper, and 48 of them take the Sunday paper also.

Jack has to pay for his papers once a week. He tries to collect once a week from his customers. Here are some of the arithmetic problems he has.

1. Jack must pay $3\frac{1}{2}$ cents for each daily paper he buys and $7\frac{3}{4}$ cents apiece for Sunday papers. He is supposed to collect 5 cents for each daily paper he sells and 10 cents for each Sunday paper. How much does he make on each daily paper? How much does he make on each Sunday paper?

2. Last week, Jack delivered a daily paper every day (6 days) to all 56 customers. He also sold 8 extra daily papers. How many daily papers did Jack need to buy last week?

Pages 282 and 283 are to be used after page 133.

3. At $3\frac{1}{2}$ cents apiece, how much did Jack's daily papers cost him last week?

4. At $7\frac{3}{4}$ cents each, how much did Jack's 48 Sunday papers cost him?

5. At 5 cents for each daily paper, how much should Jack have collected for the daily papers he delivered last week?

6. At 10 cents for each Sunday paper, how much should Jack have collected for Sunday papers last week?

7. How much should Jack have collected in all from his route last week?

8. Copy the following form and use it to find how much Jack should have made on the papers he delivered last week.

Cost		*Sales*	
? daily papers @ $3\frac{1}{2}¢$	\$?	? daily @ $5¢$	\$?
48 Sunday papers @ $7\frac{3}{4}¢$	?	48 Sunday @ $10¢$	?
Total	\$?	Total	\$?

Gain on daily papers	\$?
Gain on Sunday papers	\$?
Total gain	\$?

Check the total gain by subtracting the total sales from the total cost.

9. Last week, Jack collected from 51 customers. All of them took daily papers. How much did Jack collect for dailies last week?

10. Of these 51 customers, 48 also took Sunday papers. How much did Jack collect in all from his route last week?

Pages 282 and 283 are to be used after page 133.

A Plan for Don's Garden

1. Don wants to make a scale drawing of his garden for next summer. His garden is to be 125 feet long and 75 feet wide. If Don uses a scale of 1 inch = 25 feet (1″ = 25′), how many inches long will his drawing be? How many inches wide?

Make a scale drawing of Don's garden, using this scale. Mark the dimensions in feet on your drawing.

2. Don wants to put $\frac{2}{5}$ of his garden in corn. He wants to run the corn in 75-foot rows across the short way of his garden. Two fifths of 125 feet are how many feet? Then, to mark off Don's corn plot, how many inches on the long side of your drawing should you mark off? Put the corn plot in the garden plan. Label it "Corn."

The "up-and-down" line which you drew to mark off the corn plot is called a **vertical** line.

3. Don wants to put a third of the rest of his garden into tomatoes. If he runs his tomato plot across his garden next to the corn, it will be 75 feet long. How many feet wide will it be? On your drawing, how much must you measure off for the tomato plot? Label it "Tomatoes."

4. Don is going to put half of the rest of his garden into peas. Divide the rest of Don's garden in half with a line that runs lengthwise instead of up and down. This is called a **horizontal** line. How many inches wide is your drawing of the garden? Then how many inches from the bottom must you draw your horizontal line? Call the two plots "Peas" and "Other."

How many feet long will be the part of the garden planted to peas? How many feet wide will that part be?

Pages 284 and 285 are to be used after page 135.

Thinking About Scale Drawings

How many of these questions about drawing to scale can you answer?

1. If 1 inch represents 10 feet on a scale drawing, how long would you draw a line to show 15 feet?

2. On a scale of 1 inch to 24 feet, how many feet does each $\frac{1}{4}$ inch stand for?

3. On a drawing with a scale of $1'' = 12'$, how many feet does $\frac{1}{2}$ inch represent?

4. Suppose a scale drawing has a scale of $\frac{1}{2}'' = 10'$. How many feet does each inch stand for?

5. On a scale of $\frac{1}{2}'' = 4'$, how long a line would you draw to show the length of a room 16 feet long?

6. Suppose you want to make a line 6 inches long show a room 24 feet long. What scale would you use?

7. How many feet to the inch would your scale be if a line 6 inches long is to stand for 48 feet? For 12 feet? For 30 feet?

8. On a drawing with a scale of $1'' = 20'$, what distance does a line $2\frac{1}{2}''$ long represent?

9. On a scale of $1''$ to $60'$, what distance does a line $1\frac{1}{2}''$ long represent? Suppose you used a scale of $1'' = 30'$. How long would you have to draw a line to show this same distance?

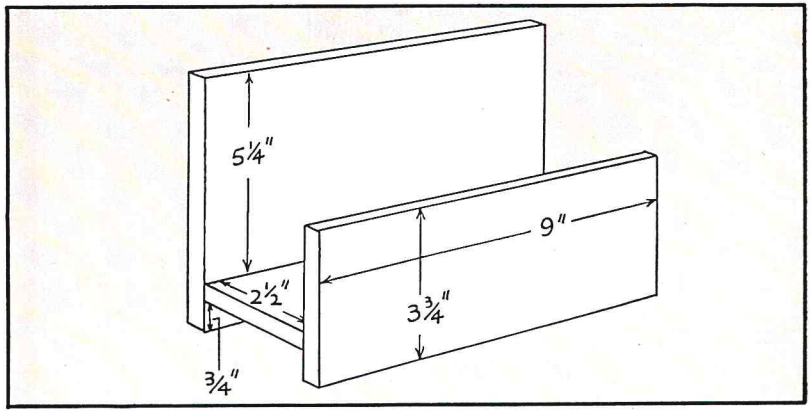
10. A floor plan of a house is drawn on a scale of $\frac{1}{2}'' = 2'$. How many feet long is the living room of the house if it is $6''$ long on the plan?

11. On a scale drawing, $1'' = 8'$. What scale would you use to make the scale drawing twice as long?

Pages 284 and 285 are to be used after page 135.

Dick's Woodworking

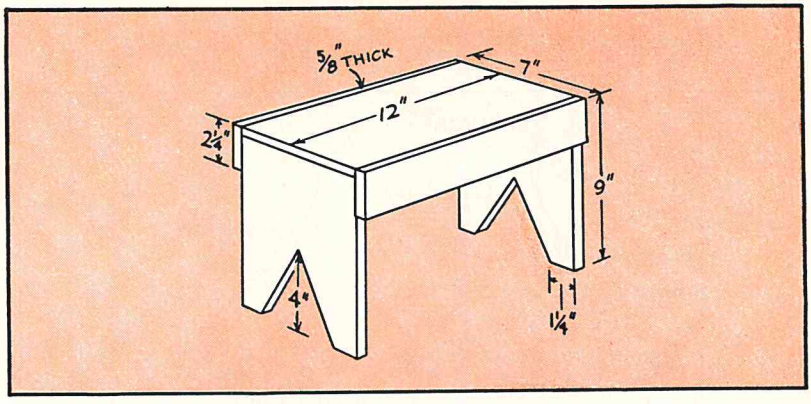
Dick likes to make things out of wood. Just now he wants to make a magazine rack. The only work drawing he can find is the one for a letter rack shown below.



Dick decides to use this work drawing but to increase the size by $\frac{3}{4}$. That is, his magazine rack will be $1\frac{3}{4}$ times as large as the letter rack. To find the new dimensions, he must multiply by $1\frac{3}{4}$.

1. How high will the lower side of the rack be? How long?
2. What will be the dimensions of the higher side?
3. How wide will the bottom of the rack be?
4. How far above the bottom of the sides will Dick nail the bottom of the rack?

Pages 286 and 287 are to be used after page 145.



5. Above is the work drawing of a footstool Dick is going to make for his mother for her birthday. He will use wood that is $\frac{5}{8}$″ thick. The height (9″) will be the same, but he is going to increase the other dimensions by $\frac{1}{4}$. That is, the stool will be $1\frac{1}{4}$ times as long and wide as the footstool in the drawing. By what improper fraction should Dick multiply the dimensions he wants to increase?

6. What will be the length of the footstool Dick is going to make?

7. What will be the width of the footstool?

8. Instead of $1\frac{1}{4}$″ from the side of the leg to the notch, how long will this distance be?

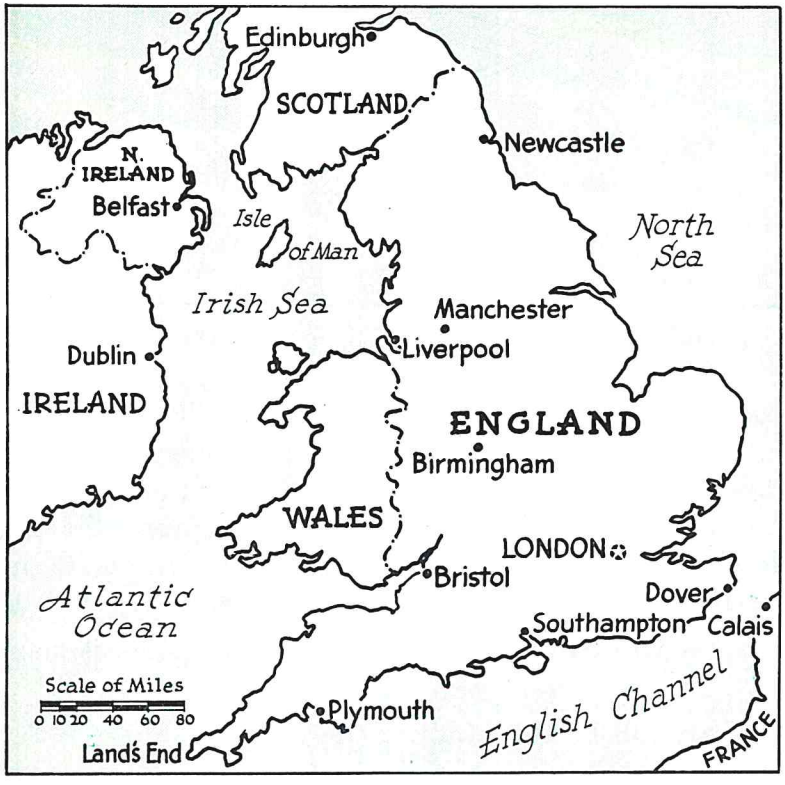
9. If Dick cuts the top of the stool and both end pieces (legs) from one wide board, how many inches long must the board be? (Add $\frac{3}{8}$″ for saw cuts and planing.)

10. Instead of $2\frac{1}{4}$″ wide, how wide should the side pieces be?

11. If the side pieces are each $\frac{5}{8}$″ thick, how wide should Dick make the middle board of the top? (See Problem 7 for the width of the whole top.)

Pages 286 and 287 are to be used after page 145.

Finding Distances on a Map



The Lanes are hoping to visit England some summer on their vacation. They have fun planning where they will go. Above is one of their maps. See if you can use it.

1. On this map the scale shows 80 miles. Measure the scale. To the nearest quarter inch, how long is it?

2. Fold a sheet of paper lengthwise, and along the crease carefully mark off the scale of miles 5 consecutive times. How many inches long is your marker? How many miles does it represent?

Pages 288 and 289 are to be used after page 151.

3. Now use your marker to measure the distance from London to Edinburgh on the map. Approximately how many miles apart are these two cities?

4. In the United States, Detroit is about 630 miles from Boston. This is how many times as far (approximately) as the distance from London to Edinburgh?

5. Southampton, England, is a port into which many of the ocean liners from the United States come. About how far is it from Southampton to London?

6. Suppose a ship landed at Plymouth instead of at Southampton. About how many miles to London is it from Plymouth?

7. Approximately how many miles farther is it from Plymouth to London than from Bristol (another seaport) to London?

8. Jean had read that the seacoast at Land's End is especially beautiful. How many miles would you travel in going from London to Land's End and back to London?

9. From Cleveland, Ohio, to Cincinnati, Ohio, is about 210 miles. How many miles more or less than this is it from London to Manchester?

10. From Atlanta, Georgia, to Dallas, Texas, is 738 miles. How many miles more or less is this than the distance from London to Dublin in Ireland?

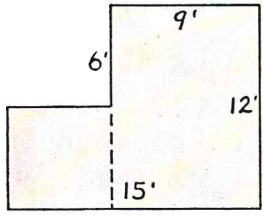
11. About how many miles is it across the English Channel, from Dover to Calais?

12. If you landed at Southampton, went up to London, down to Dover, and across to Calais, how many miles (approximately) would you travel?

Pages 288 and 289 are to be used after page 151.

Perimeters and Areas

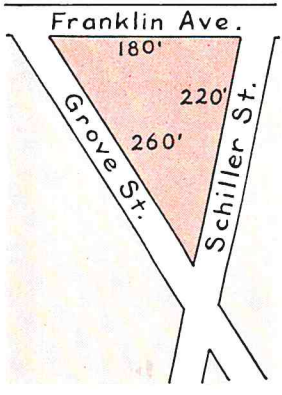
How many of these problems can you work as quickies?



1. The drawing at the left shows a room Dick and his father are measuring. They want to find how many feet of baseboard it will take to go around the room. Find the perimeter of the room and subtract 6 feet for the doors. How many feet of baseboard will they need?

2. Dick's father is also going to repaint the ceiling of this room. Can you think of a way to find the area of the ceiling, so that he will know how much area he has to paint? How many square feet is the area?

3. Dick's father is going to cover the floor of the room with linoleum tile. How many *square yards* are there in the floor? If linoleum tile costs $3.00 a square yard, how much will linoleum tile for the whole room cost?

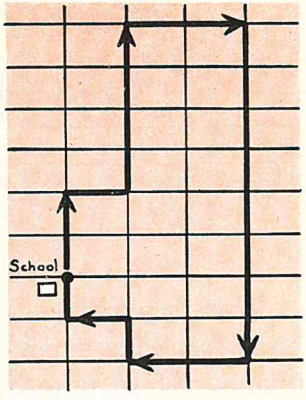


4. In Ellen's city, three streets come together to make a small park. The city is going to fence in this park as a playground for little children. The picture shows the dimensions of the park. How many *yards* of fence must the city buy?

5. A baseball diamond is 90′ on a side. How many feet must a batter run if he hits a home run? If a batter on Bill's team can run 60 yards in 12 seconds, about how long will it take him to make a home run?

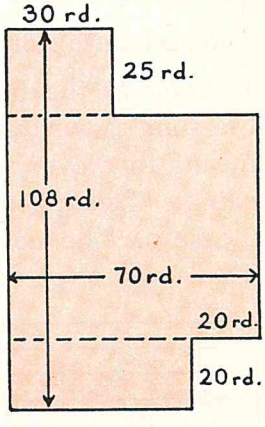
Pages 290 and 291 are to be used after page 159.

6. Last summer, Bill's Scout troop took part in the Fourth of July parade. They marched from the schoolhouse along the route shown in the drawing at the right. In the drawing, each square represents one block. In Bill's city, it takes 8 blocks to make 1 mile. How many miles did the Scouts march?



7. A regular tennis court is 78′ × 36′. The smallest size allowed for a basketball court is 74′ by 42′. Is the basketball court larger or smaller than a tennis court? How many square feet larger or smaller?

8. Don's father is thinking of buying a new piece of land that looks like the drawing at the right. If he buys it and fences it, how many rods of fence will he have to buy for it?



9. Find the area of the field in Problem 8 in square rods. How many acres are there in the field?

10. Jill lives on a farm that is shaped like a rectangle. It is $\frac{1}{2}$ mile long and $\frac{1}{4}$ mile wide. How many acres are there in the farm?

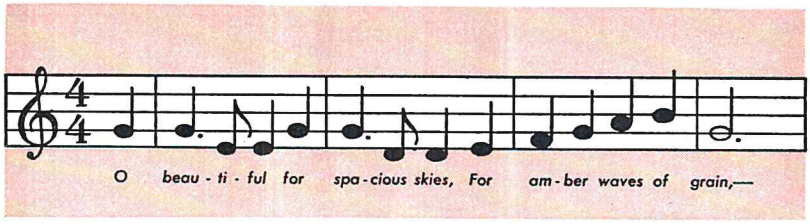
11. How many acres are there in a farm shaped like a square if each side is $\frac{1}{2}$ mile long?

12. Estimate the size of a lot 300 ft. by 100 ft. Approximately what part of an acre does it contain?

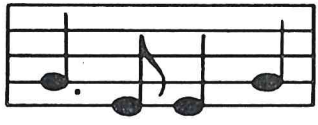
$$\frac{300 \text{ ft.} \times 100 \text{ ft.}}{200 \text{ ft.} \times 200 \text{ ft.}} = ? \text{ acre}$$

Pages 290 and 291 are to be used after page 159.

Using Fractions in Music



This is a part of one of Nancy's favorite songs. She uses fractions every time she sings it or plays it on the piano. Every note in written music has a certain value, called its length, which tells you how long to hold it. The whole note is written 𝅝 . The half note is 𝅗𝅥 or 𝅗𝅥 . The quarter note is ♩ or ♩ . The eighth note is ♪ or ♪ The sixteenth note is 𝅘𝅥𝅯 or 𝅘𝅥𝅯

1. Look at the line of music above. The $\frac{4}{4}$ shows that the song is written in $\frac{4}{4}$ (four-four) time. The lower 4 means that every quarter note should have one beat or *count*. The upper 4 means that there are 4 beats in a measure. The notes between two bars form a measure. There are three full measures in this line of music.

This is the first full measure. A dot placed after a note adds half of its value. So ♩. is equal to a quarter note plus an eighth note ($\frac{1}{2}$ of $\frac{1}{4}$).

What is the value of the first note in this measure? $\frac{1}{4} + \frac{1}{8} = ?$ What is the value of the second note? What is the value of each of the last two notes?

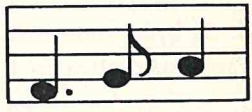
Add the values of all the notes in this measure.

$$(\tfrac{1}{4} + \tfrac{1}{8}) + \tfrac{1}{8} + \tfrac{1}{4} + \tfrac{1}{4} = \tfrac{?}{8} = \tfrac{?}{4}$$

Pages 292 and 293 are to be used after page 169.

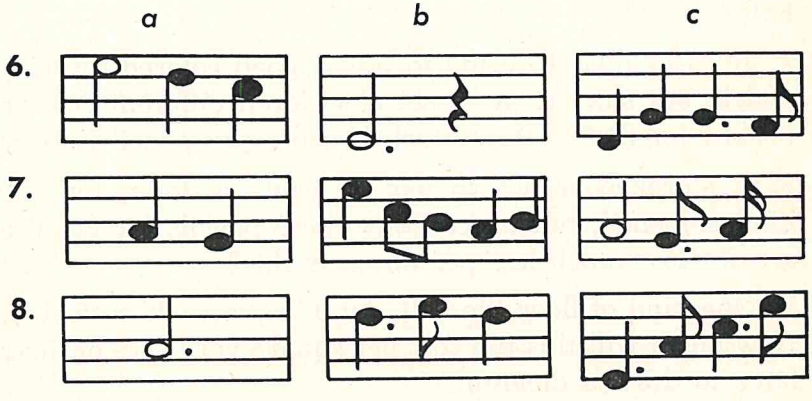
2. The measure at the right is the third full measure from the line of music on page 144. What is the value of each of these four notes? Then what is the value of the entire measure?

3. The last measure in the line of music on page 292 is not complete. What is the value of the note ? How many quarter notes will be needed to finish this measure?

4. Here is a measure from "America." Add the values of these three notes. The sum equals how many quarter notes? "America" is written in $\frac{3}{4}$ time.

5. If a song is written in $\frac{6}{8}$ time, what is the value of each beat or count? How many beats are there in each measure?

is a rest. It has the value of the quarter note. Sometimes it is called a quarter rest.

Add the values of the notes in each of the following measures to find the length of the measure. Some are $\frac{4}{4}$, some $\frac{3}{4}$, some $\frac{2}{4}$.



Pages 292 and 293 are to be used after page 169.

Measures at the Store

1. Sally bought $1\frac{2}{3}$ yards of one kind of trimming and $2\frac{1}{2}$ yards of another kind. If both kinds were 12 cents a yard, how much did she pay?

2. Dick had the lumber yard cut four boards for him. One was 4 ft. 11 in. long, one was 5 ft. 2 in., one was 3 ft. 10 in., and the fourth was $4\frac{1}{2}$ ft. How many feet of boards did Dick buy?

3. If hothouse tomatoes are 36¢ a pound, how much should the clerk charge for 20 ounces of them?

4. Apples are 10¢ a pound. A customer buys apples weighing 4 lb. 10 oz. How much should the clerk charge?

5. A store was having a sale of dress material for 55¢ a yard. Mrs. Lane bought one piece $3\frac{1}{2}$ yards long, another 4 yards long, and a third one $4\frac{3}{4}$ yards long. How much did all three pieces cost?

6. A quart box of cherries costs 35 cents, but Mrs. Lane could buy half a bushel of cherries for $4.00. How much less per quart were the cherries when bought by the half bushel?

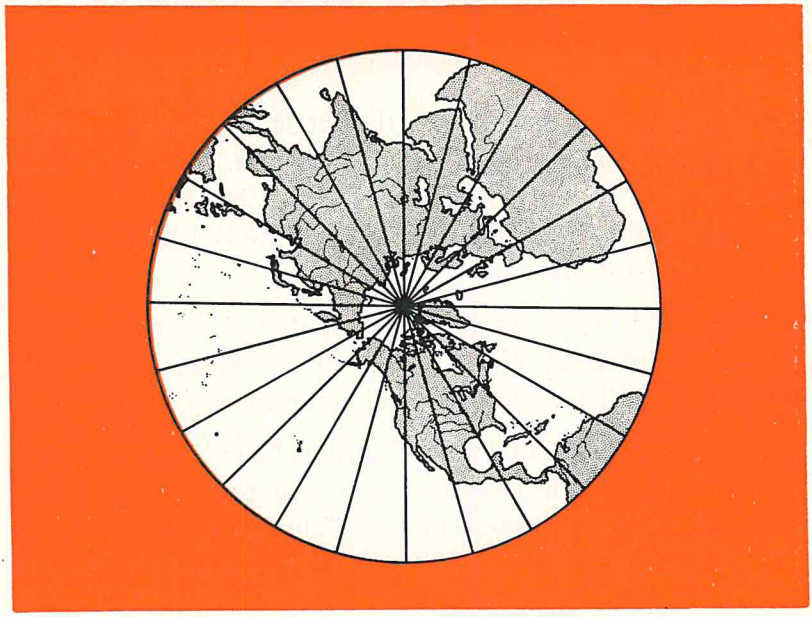
7. It costs Jean 10 cents to buy a good colored drawing pencil, but she can get a set of a dozen different colored pencils for $1.00. How much cheaper per pencil is this?

8. A storekeeper has to pay 48 cents a dozen for one kind of pencil; but he can buy these pencils for $4.56 a gross. How much less per dozen is this?

9. One kind of floor tile is 9″ by 9″ square. It costs 13¢. How much will this tile cost per square yard? (You may have to draw a diagram.)

This page is to be used after page 181.

Time Zones of the World



Just as time changes across our own country, so time changes clear around the world. It is night in India when it is daytime here. When the sun is rising in Australia, it may be setting in Brazil.

For convenience, the world has been divided into 24 time zones, one for each hour of the day. The problems below will give you some idea of the problems of international airlines, communication by telephone and radio, and so on. Since the problems mainly take clear thinking, you may be able to do them as quickies.

1. When it is noon in New York, it is 7 p.m. in Athens, Greece. So Athens time is 7 hours ahead of New York time. What time is it in Athens when it is 8 a.m. in New York?

Pages 295 and 296 are to be used after page 185.

2. When it is noon in New York, it is 6 p.m. in Paris. A man in New York wants to call his daughter in Paris at 9 p.m. Paris time. By New York time, when should he call?

3. A man in Chicago knows that it is 5 p.m. in London when it is noon in New York. At 9 a.m. in Chicago, he wants to call a firm in London. What time will it be in London then? (Remember, Chicago time is 1 hour behind New York time.)

4. When it is noon in New York, it is 1 a.m. the next day in Hong Kong. On January 31, 3 p.m., New York time, what will be the date and hour in Hong Kong?

5. A plane leaves La Guardia Field in New York at 1 p.m. New York time. It reaches Rome the next day at 5:30 p.m. Rome time. Rome time is 6 hours ahead of New York time, so how many hours does the flight actually take?

6. A flight leaves La Guardia Field at 1 a.m. Sunday morning, New York time. It reaches Cairo, Egypt, at 10:10 p.m. Monday, Cairo time. Cairo is 7 hours ahead of New York. How many hours does the flight take?

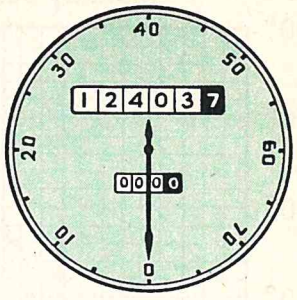
7. A plane leaves Chicago Thursday at 10 a.m. Chicago time. It reaches Geneva, Switzerland, at 4:35 p.m. Friday, Geneva time. Geneva time is 6 hours ahead of New York time. How many hours does the flight take?

8. A traveler leaves La Guardia Field at 1 p.m. Friday, New York time. He reaches Bombay, India, at 6:30 p.m. Sunday, India time. (India has its own special kind of international time which is $10\frac{1}{2}$ hours ahead of New York time.) How many hours does the trip take?

Pages 295 and 296 are to be used after page 185.

An Automobile Trip

Last summer, Jean and her father took an automobile trip together. Jean kept track of the arithmetic. Sometimes she got the right answer. Sometimes she made a mistake.



Check each answer below, to see whether Jean was right.

1. The picture shows the speedometer reading when they started. When they stopped for lunch, the speedometer read 12553.1. Jean thought they had come 159.4 miles.

2. That night, the speedometer read exactly 12729 miles. Jean said they had come 325.3 miles that day.

3. When they started the next morning, Mr. Lane said, "It's exactly $47\frac{1}{2}$ miles from here to Zenith City. What will our speedometer read when we get there?" Jean's answer was 12776.5 miles.

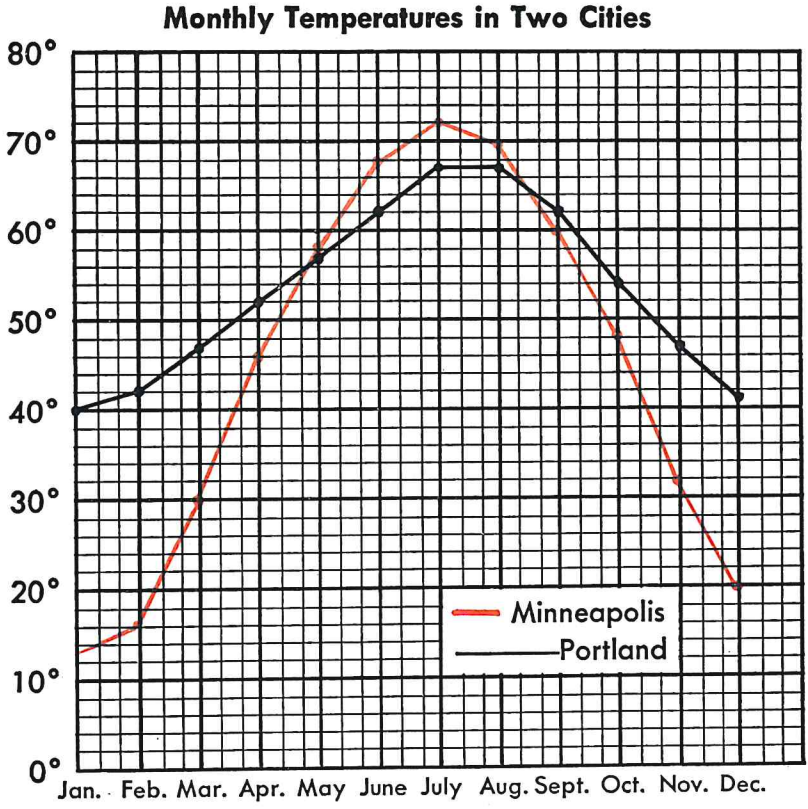
4. On the way to Zenith City, they had to detour. When they got to Zenith City, the speedometer read 12784.1. Jean said they had traveled 8.6 miles farther than they had expected to (see Problem 3).

5. When Jean and her father got to the end of their journey that afternoon, the speedometer read 13006.3. Jean said that in two days they had driven 602.6 miles.

6. Jean and her father drove back home another way. When they reached home, their speedometer read 13660.6. Jean said their trip home was 654.3 miles (see Problem 5), or 51.7 miles longer than their trip away from home.

This page is to be used after page 194.

Can You Read Double Line Graphs?



Tom has two girl cousins. Polly lives in Portland, Oregon. Jane lives in Minneapolis, Minnesota.

For fun one night, Tom and his father made a graph showing the average monthly temperatures in these two cities. See if you can read the graph and answer the following questions.

1. What is the monthly average temperature in Minneapolis in April? In July?

Pages 298 and 299 are to be used after page 203.

2. What is the monthly average temperature in Portland in February? In November?

3. About how much colder, on the average, is it in Minneapolis in January than in Portland? To which girl should Tom's family send ice skates as a Christmas present?

4. In what two months is the temperature nearly the same in both cities?

5. What is the hottest month in Minneapolis? What does the temperature there average during this month? About how much hotter is it during this month in Minneapolis than in Portland?

6. What is the difference between the highest and the lowest average monthly temperature in Portland? In Minneapolis? How many degrees greater is this range of temperature in Minneapolis than in Portland?

7. How many months of freezing and below-freezing weather does Minneapolis have?

8. During how many months is Minneapolis weather hotter than Portland's?

9. Here are some words and phrases that might describe the climates of these two cities. Study the graph. Write on your paper the phrases that you think would apply to Portland. Then write the ones that would apply to Minneapolis. A phrase may apply to both cities.

a. mild weather
b. pleasant summers
c. cold winters
d. small temperature range
e. winters above freezing
f. big seasonal differences

10. Is the difference between Portland and Minneapolis temperatures greater in the summer or in the winter? In which month is the difference the greatest?

Pages 298 and 299 are to be used after page 203.

Problems With Three Processes

Each problem on this page has three steps, and uses three different processes. The signs for the three processes are given you. See if you can write a final question for each problem, using the process the third sign calls for. Then work the problem.

× ÷ + **1.** At the store, Sally bought 3 cans of corn at 21 cents a can, half a dozen eggs at 68 cents a dozen, and a box of crackers for 27 cents.

× + − **2.** Jerry got $5 for his birthday. He sent for 2 packets of stamps at $1.29 a packet, and a new magnifying glass for $1.70.

× + ÷ **3.** Sue made some candy for a school sale. She has 6 dozen pieces of fudge, and 40 pieces of taffy. She can get 28 pieces in a box.

× + − **4.** Don had $37.50 in the bank. One Saturday, he worked $6\frac{1}{2}$ hours for his father at 40 cents an hour and deposited this money. A few days later he drew out $5 to buy a baseball glove.

− + ÷ **5.** At the start of a trip, Mr. Lane's speedometer read 14397.6. At the end of the trip, it read 14955.6. During the trip, Mr. Lane bought 10 gallons of gasoline, 12 gallons, and 9 gallons.

× + ÷ **6.** Bob tries to save a third of what he takes in from his egg and chicken business. Last week, Bob sold 12 dozen eggs at 55¢ a dozen, and $5.85 worth of chickens.

+ ÷ − **7.** In 4 weeks last March, an average of 150 children a week visited our art museum. This March, in 4 weeks, the attendance was 180, 135, 167, and 174.

This page is to be used after page 209.

Baseball and Decimals

Bill is a baseball fan. He knows that batting averages and team standings are figured in *decimals.* The decimals make it easy to compare batters and teams. For instance, does a team that wins 5 games out of 7 have a better record than a team that wins 6 games out of 8? If Joe Doakes has 5 hits out of 15 trips to the plate, is he batting better, or worse, than Dick Oaks, with 8 hits out of 22 tries?

Baseball decimals are figured to the *nearest thousandth.* That is, they are three-place decimals.

To find a player's batting average, divide the number of hits by total times at bat. (Bases on balls and sacrifice hits don't count.)

To find a team's standing, divide the number of games won by the total number of games played.

Now see if you can do the following problems.

1. Last summer, Bill and Tom both played on baseball teams. Bill's team played 15 games and lost 6 of them. Find the standing of Bill's team to the nearest thousandth.

Tom's team played 16 games and lost 7. What was the standing of Tom's team?

What team had the better record?

2. Bill got 19 hits, last summer, out of 78 times at bat. What was Bill's batting average?

Pages 301 and 302 are to be used after page 213.

3. Tom got 15 hits out of 62 trips to the plate. What was Tom's batting average? Was it better or worse than Bill's? By how much?

4. If Bill's team plays a total of 20 games this summer, how many games would it need to win to have a team standing of .600? (What is .600 of 20 games?)

5. In 500 trips to the plate, how many hits would a player have to make to have a batting average of .400?

6. Bill was looking up some old records the other day. He found that in one of Babe Ruth's best years, the great batter got 205 hits out of 522 tries. What was his batting average that year?

7. In a recent year, the Cleveland Indians won 93 out of 154 games. What was their final standing? (Add zeros and keep on dividing. How many times must you divide?)

8. That same year, the Washington Senators won 78 games and lost 76. What was their standing?

9. If the St. Louis Cardinals won 88 games and lost 66, how do they compare with the New York Giants, who won 92 and lost 62?

10. One year, a Pittsburgh Pirate player was at bat 318 times and got 108 hits. What was his batting average?

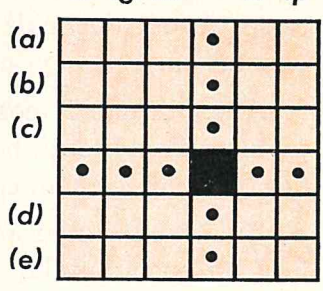
11. In that year, the highest batting average in both major leagues was made by a Boston Red Sox player, with 150 hits in 424 times at bat. What was his average? How many points higher than the Pirate player's average was this?

12. One of the Detroit Tigers got 218 hits out of 640 times at bat. What was his average? How many points under the Red Sox player's average was he?

Pages 301 and 302 are to be used after page 213.

Decimals in Cross-Number Squares

1. Copy the puzzle square (don't forget the decimal points!). As in other cross-number puzzles, work the *Across* examples first. Fill in the answers. Check by working the *Down* examples and seeing if the answers agree.



Across: *(a)* 7.9 × 21.5
(b) 1632.8 ÷ 8 *(c)* 10 × 13.954
(d) $313\frac{3}{4}$ expressed as a decimal *(e)* 1073.87 ÷ 3.5

Down: *(f)* 11 × 11.03 *(g)* 6 hundreds, 0 tens, 3 ones, 1 tenth, 0 hundredths *(h)* 1822.23 − 872.87 *(i)* 217.82 + 309.47 + 288.49 *(j)* $\frac{1}{5}$ of 2522.6.

2. Copy the square again and use the examples below to complete it.

Across: *(a)* 8 × 19.11 *(b)* 4 hundreds, 3 tens, 9 hundredths *(c)* 10 × $11\frac{3}{4}$, expressed as a decimal *(d)* 1433.7 ÷ 10 *(e)* 2268.432 ÷ 5.9

Down: *(f)* $\frac{1}{4}$ of 564.52 *(g)* 4 × 132.87 *(h)* 572.21 − 364.87 *(i)* 228.68 + 92.29 + 366.45 + 117.92 *(j)* .25 × 3563.12

3. Copy the square again. This time, the numbers to go in the square are the missing numbers in the following examples.

Across: *(a)* 349.47 + ? = 537.09 *(b)* .08 × ? = 35.868 *(c)* $\frac{2}{3}$ of ? = 222.22 *(d)* 400 − ? = 77.82 *(e)* ? + 763.92 + 54.38 = 982.54

Down: *(f)* 4.6 × ? = 659.226 *(g)* ? ÷ 10 = 84.326
(h) 839.72 − ? = 56.48 *(i)* $\frac{1}{4}$ × ? = 158.28
(j) 1000 × ? = 253840.

This page is to be used after page 221.

Working With Money Numbers

When you divide or multiply money numbers, it may be easier to use decimals than fractions. In these problems, express each money answer to the nearest cent.

1. Allen thinks it costs him about $3\frac{1}{4}¢$ to develop one picture. Last month he developed 37 pictures. How much did developing them cost? ($3\frac{1}{4}¢ = \$.0325$)

2. Bill wants a newspaper route next year. If he makes $2\frac{1}{4}¢$ on each Sunday paper and has 50 customers, how much will he make on Sunday papers each week?

3. How much should the clerk charge Mrs. Lane for $4\frac{1}{8}$ yd. of material at $1.89 a yard?

4. Mr. Lane found that it cost him $6.7¢$ a mile to run his car last year. If his expenses per mile run at the same rate this year, how much will it cost him to drive his car 15,000 miles?

5. Bob is selling some chickens to the local butcher. How much will he get for $24\frac{3}{8}$ lb. of chickens at $47\frac{1}{2}¢$ a pound?

6. Jerry wants a set of 18 stamps. He finds the set in a catalog for $3.15. What is the average price per stamp, to the nearest tenth of a cent?

7. Last week, Don helped his father $9\frac{3}{4}$ hours at $37\frac{1}{2}¢$ an hour. How much should Don get for this work?

8. The Grays are putting floor tile, at $3.96 a square yard, on their kitchen floor. The floor is $4\frac{1}{2}$ yd. wide and $5\frac{1}{4}$ yd. long. How much will the tile cost?

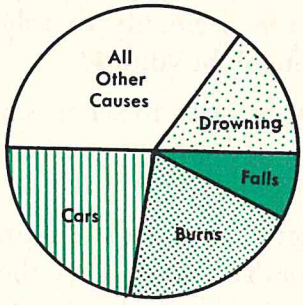
9. Mr. Lane wants $1.00 worth of gasoline. At $26\frac{1}{5}¢$ a gallon, how many gallons (to the nearest tenth) can he buy?

This page is to be used after page 227.

Picturing Safety Facts

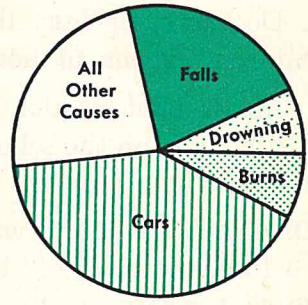
Accidental Deaths
(Birth to 14 Years)

I



Accidental Deaths
(All People)

II



Don's class is studying safety, and Don found some graphs showing safety facts. Study the graphs, and see if you can answer the questions below as quickies.

1. Graph I shows causes of accidental deaths of boys and girls up to 14 years of age. Outside of "all other causes," what seems to cause more deaths among young people in this age group than anything else?

2. Are the accidental deaths caused by cars more, or less, than $\frac{1}{4}$ of all the accidents among this group?

3. What is the second largest single cause of accidental deaths in this group? The third largest?

4. Graph II shows accidental deaths among all the population, including both children and older people. In the whole group, is the fraction of the accidental deaths caused by cars larger, or smaller, than among children?

5. In Graph II, what is the second largest cause of death?

6. Are burns as important a cause of death among the whole population as among young people? Is drowning?

Pages 305 and 306 are to be used after page 229.

7. Graph III, at the bottom of this page, shows *injuries* (not deaths) of school children. Do more, or less, than $\frac{1}{2}$ of the injuries happen at school and on the way to or from school?

8. Do more, or less, than $\frac{1}{4}$ of the accidents to school children happen at home? In school buildings?

9. About what fraction of the total injuries to school children happen on the school grounds, and going to and coming from school?

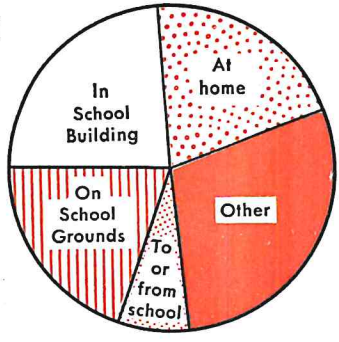
10. Graph IV shows where accidents in school buildings are likely to happen. Do more, or less, than $\frac{1}{4}$ of these accidents happen in the gymnasium? About what fraction happens either in the gymnasium or in halls and on stairways?

11. Do more accidents seem to happen in the classroom or in the shop?

12. If you could cut in half the number of accidents in the gymnasium and in the shop, about what fraction of accidents to pupils would you have removed?

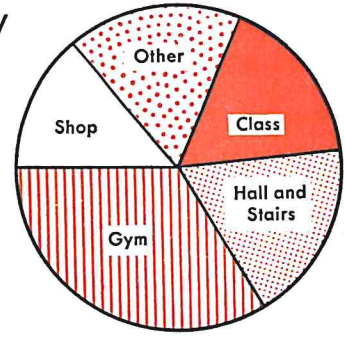
Accidents to School Children

III



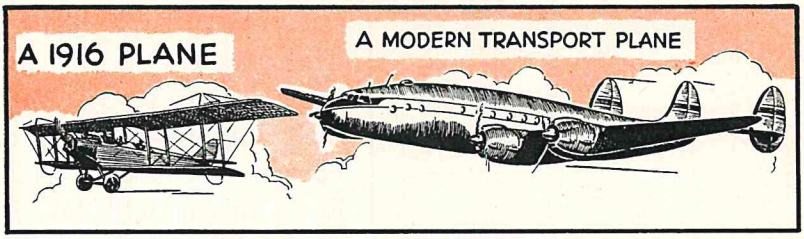
Where School Accidents Happen

IV



Pages 305 and 306 are to be used after page 229.

Using Arithmetic in Aviation



1. An aviator flying a 1916 model airplane made a record flight of about 1320 miles in 24 hours. Find his average speed in miles per hour.

2. A Constellation flew from New York City to San Francisco in about $23\frac{1}{2}$ hours. The distance is about 2585 air miles. How many miles an hour was this?

3. A jet transport plane flew from London to South Africa, a distance of 6000 miles, in $17\frac{1}{4}$ hr. To the nearest mile, how many miles an hour did it average?

4. In 1927, Charles A. Lindbergh flew from Mineola, N. Y., to Paris in $33\frac{1}{2}$ hours. The distance was 3600 miles. To the nearest mile, how many miles an hour did he average?

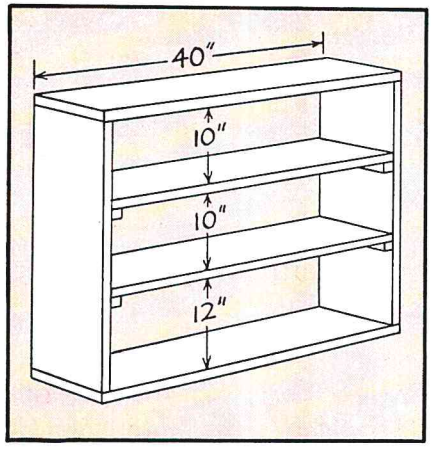
5. A Constellation flew from New York to Paris, about the same distance as Lindbergh flew, in $16\frac{1}{2}$ hours. About how many more miles an hour than Lindbergh did it average?

6. One four-engine transport plane uses about 220 gallons of gasoline per hour. How many gallons will it use in flying $23\frac{1}{2}$ hours from New York to San Francisco?

7. Some light planes use only about 4 gallons of gasoline an hour. If a plane cruises at 85 miles an hour, how many gallons of gasoline should a trip of 680 miles take?

This page is to be used after page 231.

Making Things



Dick is going to make a bookcase. The shelves and the sides are to be of 10-inch lumber—that is, of boards 10 inches wide. Each board will be $\frac{3}{4}$″ thick. The little braces under each shelf are to be of lumber 1″ square.

1. The bottom shelf is for big books, so the space between this shelf and the next shelf will be 12″ (look at the diagram). The space between each of the other pairs of shelves is 10″. The top shelf and the bottom shelf come out over the sides.

To find the length of each side, add the three spaces between the shelves (12″ + 10″ + 10″). Then add 2 × $\frac{3}{4}$″ to allow for the thickness of the two middle shelves. How long a board will Dick need to make the two sides?

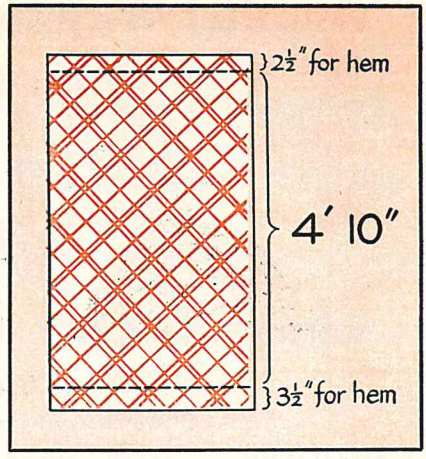
2. The top shelf and the bottom shelf will each be 40″ long. The length of each of the two middle shelves will be 40″ minus 2 × $\frac{3}{4}$″. Do you see why? How much wood will Dick need for the four shelves?

3. Now add the wood for the 2 sides and the 4 shelves. How many feet of 10-inch lumber will Dick need to buy for all these pieces?

4. How many braces will Dick need? How long is each brace? Then how long a strip of 1″ by 1″ wood will Dick need for the braces?

Pages 308 and 309 are to be used after page 235.

Sally is planning to make some new curtains for the two windows in her room. She will need 4 curtains, two for each window.

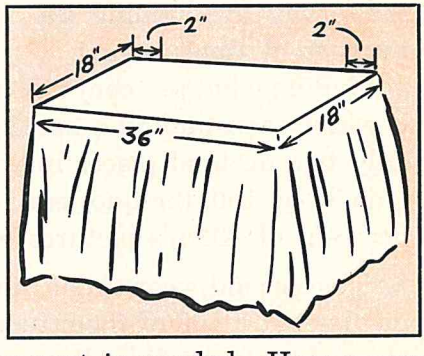


5. Each curtain, when finished, is to be 4 ft. 10 in. long. An extra $2\frac{1}{2}$ inches will be needed to make a hem at the top and $3\frac{1}{2}$ inches for a hem at the bottom. How many feet and inches of material will each curtain take?

6. How many yards of material must Sally buy for all four curtains?

7. If Sally buys 8 yards of material, how many inches will she have left after she makes the curtains?

8. Mrs. Gray and Sue are making a skirt for Sue's dressing table. The table is 18″ wide and 36″ long, and the skirt will go round the front, both sides, and 2″ at each side of the back. How many inches is this?



9. In order to make the gathers, three times this amount is needed. How many *yards* of material should Sue and her mother buy?

10. If the material Sue wants costs $1.10 a yard, how much will the skirt of her dressing table cost?

Pages 308 and 309 are to be used after page 235.

Another Way to Find Per Cents

$$\begin{array}{r} .55 = 55\% \\ 160\overline{)88.00} \\ \underline{80\,0} \\ 8\,00 \\ \underline{8\,00} \end{array}$$

1. The first year Allen had his camera, he took 160 pictures. Of these, only 88 pictures were good ones.

To find what per cent of good pictures Allen got the first year, divide the number of good pictures (88) by the total number of pictures (160). You found a baseball player's batting average in much the same way by dividing the number of hits by the total number of times at bat.

Finding what per cent one number is of another number is easier than finding a batting average because you need only two decimal places in your quotient. When you divide 88 by 160, the quotient is 55 *hundredths*. Then what per cent of Allen's pictures were good the first year?

2. The second year Allen had his camera, he took 120 pictures, and 102 of them turned out well. What per cent of good pictures did Allen get the second year?

3. Tom now has 64 people on his paper route. Forty-eight of them take the Sunday paper as well as the daily. What per cent of Tom's customers take the Sunday paper?

Pages 310 and 311 are to be used after page 247.

4. Nora recently counted the books she had read in the "library corner" of her classroom this year. Out of 60 books, she had read 27. What per cent was this?

5. Last year, out of 75 accidents in our school, 21 were caused by running in the halls and on the stairs. What per cent of the accidents were caused this way?

6. Sam goes to a consolidated school. Of the 325 pupils in the school, only 52 live less than 2 miles away. What per cent live 2 miles or more away?

7. If a hen laid an egg every day, she would be producing 100%. In April, Bob's prize hen, Molly, laid 27 eggs. What per cent of possible production did Molly achieve?

8. Bob's poorest hen laid only 18 eggs in April. Her per cent of production was how many percentage points lower than Molly's?

9. Last year, Don sold about $50 worth of vegetables from his garden. Of this amount, $15 came from his tomatoes. What per cent of Don's sales were tomatoes?

10. About $18 of Don's income came from corn. What per cent was this of the total?

11. About $6 of Don's income came from peas. What per cent of Don's income came from peas?

12. What per cent of Don's income came from selling vegetables other than corn, tomatoes, and peas?

13. Bill wonders if his bowling is getting any better. Last week he scored 210 points out of a possible 600. This week he scored 360 points out of a possible 900.

What per cent of a perfect score did Bill make last week? What per cent did Bill make this week? By how many percentage points did his score improve?

Pages 310 and 311 are to be used after page 247.

Tables of Measures

Measures of Length

12 inches (in.) = 1 foot (ft.)
3 feet (ft.) = 1 yard (yd.)
$5\frac{1}{2}$ yards (yd.) = 1 rod (rd.)
1760 yards = 1 mile (mi.)

Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)
160 square rods (sq. rd.) = 1 acre (A.)
640 acres (A.) = 1 square mile (sq. mi.)

Measures of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes (min.) = 1 hour (hr.)
24 hours (hr.) = 1 day (da.)
7 days (da.) = 1 week (wk.)
12 months (mo.) = 1 year (yr.)
365 days = 1 year
366 days = 1 leap year

Measures of Weight

16 ounces (oz.) = 1 pound (lb.)
2000 pounds (lb.) = 1 ton (T.)

Kitchen Measures

3 teaspoons (tsp.) = 1 tablespoon (tbs.)
16 tablespoons (tbs.) = 1 cup (c.)
2 cups (c.) = 1 pint (pt.)

Liquid Measure

2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)

Dry Measure

2 pints (pt.) = 1 quart (qt.)
8 quarts (qt.) = 1 peck (pk.)
4 pecks (pk.) = 1 bushel (bu.)

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